United States Department of the Interior

FISH AND WILDLIFE SERVICE
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Sacramento, California 95825-1846

In Reply Refer To:
ER 04/0786, 04/0920

Ms. Magalie R. Salas, Secretary
Federal Energy Regulatory Commission
888 First Street NE
Washington, DC 20426

ORIGINAL

Dear Ms. Salas:

Subject: U.S. Fish and Wildlife Service Comments on the October 2004 Preliminary Application Document, Scoping Document 1, and Study Requests for the DeSabla-Centerville Hydroelectric Project, Federal Energy Regulatory Commission Project #803-068

The U.S. Fish and Wildlife Service (Service) has reviewed the October 2004 Preliminary Application Document (PAD) and Scoping Document 1 (SD1) for the relicensing of the DeSabla-Centerville Hydroelectric Project (Project), Federal Energy Regulatory Commission (Commission) Project #803-068. This facility, operated by Pacific Gas and Electric Company (PG&E), is located on Butte Creek and the West Branch Feather River, in Butte County, California. The Project occupies 178 acres of lands of the United States, managed by the Forest Service and the Bureau of Land Management. On October 4, 2004, the Licensee filed its PAD and Notice of Intent to File a License Application and Pre-Filing Document under the Commission's Integrated Licensing Process (ILP) and Commencing Licensing Proceeding. On October 19, 2004, the Commission issued a Notice of Scoping Meetings and Soliciting Scoping Comments on the Project. On December 3, 2004, the Commission issued a Notice of Intent to File a License Application, Filing of PAD, Solicitation of Comments on the PAD and Scoping Document, Solicitation of Study Requests, and Commencement of Proceeding. The Service submits the following comments and recommendations under the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. § 1531 *et seq.*), the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. § 661 *et seq.*), the Migratory Bird Treaty Act (MBTA), as amended; (16 U.S.C. § 703 *et seq.*) and the Federal Power Act (FPA) (16 U.S.C. § 791a, *et seq.*).

Goals and Objectives

The Service seeks the accomplishment of several resource goals and objectives through the licensing process for this Project.

The Service is directed to employ an ecosystem approach to ensure conservation of fish and wildlife resources throughout all of its programs. This includes participation in the Commission's relicensing process. The ecosystem approach requires the Service to adopt a more comprehensive view within regions and watersheds. The Service encourages the development of comprehensive watershed management plans that foster ecosystem health, through identification of dominant geomorphological features and processes, land use practices and other activities that may be affecting the drainage. This approach provides more thorough analysis of effects to fish and wildlife resources caused by activities such as hydroelectric development, agriculture, grazing, and other human disturbances, and identifies a broader range of opportunities for ecosystem improvements.

The Service's goal is to conserve and restore the essential attributes of the watershed ecosystem affected by the Project. These attributes include: (1) seasonal discharges that are patterned after the timing, frequency, magnitude, duration, and rate-of-change of the natural unimpaired hydrograph; (2) channel features, flood-plains, and riparian vegetation that are shaped, adjusted, and maintained by sufficient instream flows and large and moderate floods; (3) the conservation and enhancement of natural patterns of the supply, transport and storage of sediments and large woody debris so that imports at the upstream end of a reach are balanced by exports at the downstream end; (4) compliance with water quality standards; (5) the conservation and enhancement of distributions and abundances of indigenous aquatic, semi-aquatic, and riparian biota, as well as species dependent upon these biota; (6) and the conservation and enhancement of available habitats for these indigenous biota by sufficient instream flows and the necessary components of a natural unimpaired hydrograph.

To achieve this goal, a major objective of the Service is the design of an instream flow regime for implementation in the Project-affected stream reaches, as a component of our FPA fish and wildlife recommendations. This task requires that the Service obtain, review, and interpret information regarding Project effects in several resource areas: watershed hydrology; water quality; fluvial geomorphological processes (including supply, transport, and storage of coarse sediment and large woody debris); the distributions and abundances of aquatic, semi-aquatic, and riparian biota, as well as species dependent upon these biota (e.g., the bald eagle); the availability of suitable habitat, expressed as a function of discharge, for affected species; and the compatibility of recreational uses with the habitat conditions required by fish and wildlife.

Another Service goal for the new licensing of the Project is to succeed in having the Commission include as license conditions, protection, mitigation and enhancement (PM&E) measures that sustain normal ecosystem functional processes including hydrologic and hydraulic patterns, and geomorphic processes such as sediment transport, channel maintenance, channel feature diversity and complexity, and chemical/physical characteristics, such as water temperature, nutrient

transport, and water quality (chemical constituents). Maintaining these functional processes during the term of the new license will in turn provide the habitat to support healthy fish and wildlife populations.

The Service encourages implementation of an adaptive management strategy because it allows for continued evaluation and adjustment of measures over the term of the license, bringing us closer to the desired level of protection for fish and wildlife resources. The adaptive approach is particularly appropriate where there are insufficient data and uncertainties about those measures that will be most effective for meeting ecosystem goals and objectives. This is consistent with the adaptive strategy for PM&E measures being implemented successfully on several new or amended Commission licenses recently issued in California, e.g., New Don Pedro, (FERC #2299), Lower Mokelumne River (FERC #2916), Rock Creek-Cresta (FERC #1962), and Mokelumne River (FERC #137). In these licenses, the licensee was required to establish a technical assistance group to assist the licensee in developing and implementing post-license specific measures and monitoring performance of those measures over the term of the license. These licenses include resource tools available to the licensee and the technical assistance group, such as blocks of water, flexible flow schedules, funding and other tools for real time monitoring, and responsive actions to improve resource protection.

The existing license for the Project contains specific requirements for instream flows and other fish and wildlife protection measures. However, technical studies have demonstrated that the levels of resource improvements needed for the new license are substantial.

Pre-Application Document (PAD)

General Comments on PAD

The Service compliments the applicant in preparation of the October 4, 2004, PAD which provides comprehensive existing, relevant, and reasonably available information intended to enable participants in the relicensing proceeding to identify issues and related information needs; develop study requests and study plans; and ultimately, to prepare documents analyzing the applicants Application for New License (License Application) to be filed with the Commission by October 11, 2007. The Introduction section describes how the ILP process was developed and implemented to date. This section is clearly written and provides useful insight into the ongoing collaborative process. The figures depicting project features, locations and the tables displaying data throughout this document are well done and facilitated our review.

The PAD provides brief overviews of the applicant proposed Potential Studies and Informational Gathering Needs by Resource in Section 6.3. Section 6.3 provided well organized preliminary information for developing and coordinating proposed draft technical study plans and planning new studies with interested parties. Organization and categorization of the individual study plans into labeled groups, in Section 6.3.11 Summary of Potential Studies and Information Gathering

Needs by Resource, enabled better understanding and tracking of the various plans during our review.

After release of the October 2004 PAD, the Service received additional detailed information as required by CFR § 5.9 of the applicant's proposed study plans via e-mail on December 30, 2004, and January 3, 2005. The applicant developed 14 preliminary study plans, in order to expedite the review process, so that they can be implemented during the 2005 study season. Due to the short timeframe, we have conducted preliminary review of 9 of the 14 the applicant proposed draft technical study plans received via e-mail and our comments are included as Enclosure B to this letter. Our review comments are in bold and italic as requested by the applicant. We plan to provide additional comments on these draft technical study plans as they are revised and developed over the next few months with the collaborative workgroup.

Specific Comments on PAD

1.7 Volume 1 Definitions of Terms, Acronyms and Abbreviations:

Page 1-30 (and Overview, Page 3-2, Paragraph 2) - Please clarify the definition of "project area" as it is discussed in the text of the PAD and further clarify the specific survey/study boundaries for the proposed technical study plans in Section 6.3 "Potential Studies and Information Gathering Needs by Resource." The applicants definition of "project area" states "...and the WBFR from Round Valley Reservoir down to, but not including, the non-Project Miocene Diversion." It is not clear if Philbrook Reservoir and Creek are included in this definition because it is not explicitly stated. Other proposed discussions of technical studies in the PAD refer to "affected stream reaches" but do not explicitly state what stream reaches the applicant believes are affected by the project. The brief descriptions of the locations of some of the studies proposed in Section 6.3 were vague and the Service is unclear as to the exact areas the studies were proposed to be conducted. Additional maps should be provided showing the specific survey/study boundaries for each proposed technical study plan, and project affected areas, to assist in clarifing this issue.

2.2 Proposed Communications Protocol:

2.2.2 Documents - The Service requests hardcopies of all formal documents and informal documents greater than 50 pages, especially those containing figures and maps, to facilitate our review.

4.0 Project Location, Facilities, and Operations:

4.1 Project Introduction and Location - The Service requests that the applicant provide Township, Ranges and Sections, the U.S.G.S. 7.5 minute quads, as well as NAD83 UTM Coordinates of the Project Area, to aid in adequately assessing the Project.

6.3.2 Water Resources

Develop Unimpaired and Regulated Hydrology for Project-Affected Stream Reaches:

Page 6.3-2, Paragraph 4 - The Service appreciates the applicant developing unimpaired and regulated hydrology. This data will assist resource agencies in developing adequate protection mitigation and enhancement measures for fish and aquatic resources.

Page 6.3-3, Paragraph 3 and 4 - The Water Temperature Model proposed by the applicant, should be extended all the way to Parrot-Phelan Dam, or at least to the downstream end of adult spring-run holding habitat downstream of Centerville Powerhouse. This information will assist the Service and stakeholders in examining tradeoffs of holding habitat above versus below Centerville Powerhouse associated with increased flows in the reach above Centerville Powerhouse. The above information is needed to be able to evaluate trade-offs in summer spring-run Chinook salmon rearing habitat for the bypass reach versus the reach downstream of Centerville Powerhouse.

Page 6.3-4, Paragraph 1: Measure and Evaluate Water Quality in Project Reservoirs and Project-Affected Stream Reaches- The Service suggests that petroleum hydrocarbons be measured in Round Reservoir and Philbrook Reservoir as a part of the Water Quality Study so that the information can be used to compare the levels in both reservoirs and identify potential sources.

6.3.3 Fish and Aquatic Resources (Including related RT &E and Riparian, Wetland and Littoral Habitat Resources)

Perform Instream Flow Studies on Butte Creek:

Page 6.3-4, Paragraph 3 - The Service requests that 2-D instream flow (IFIM) studies be conducted in the project affected reaches of Butte Creek, the West Branch of the Feather River, and associated streams (in all project affected stream reaches and below project diversions). This information will assist in making fully informed decisions and providing scientific justification for PM&E flow recommendations for fish and aquatic resources on project affected streams (See Study Requests Section of this letter).

Page 6.3-4, Paragraph 3, Sentence 7 - The PAD indicates that the applicant propose to use Service spawning criteria, as reported in the Service's CVPIA "Instream Flow Investigations for Butte Creek Spring-Run Chinook Spawning, 2003," with their transects to generate spawning habitat for spring-run Chinook salmon. The Service advises that the applicant should use our flow-habitat relationships for spring-run spawning. The 2-D methodology is considered superior to the 1-D PHABSIM methodology and does a better job at simulating river hydraulics. Given that the Service has already conducted a thorough instream flow study in 2003, and used 2-D modeling to develop the flow-habitat relationships for spawning spring-run Chinook salmon, there is no need to conduct this same analysis using an older, antiquated 1-D PHABSIM methodology that is technically inferior to the 2-D model.

Page 6.3-4, Paragraph 3 - The Service requests that 2-D modeling be used instead of 1-D IFG-4a modeling. The 2-D model avoids problems of transect placement, since the entire site can be modeled. The 2-D model also has the potential to model depths and velocities over a range of flows more accurately than PHABSIM because it takes into account upstream and downstream bed topography and bed roughness, and explicitly uses mechanistic processes (conservation of mass and momentum), rather than Manning's "n" and a velocity adjustment factor. Other advantages of 2-D modeling are that it can explicitly handle complex habitats, including transverse flows, across-channel variation in water surface elevations, and flow contractions/expansions. The model scale is small enough to correspond to the scale of microhabitat use data with depths and velocities produced on a continuous basis, rather than in discrete cells. The 2-D model does a better job of representing patchy microhabitat features, such as gravel patches. The data can be collected with a stratified sampling scheme, with higher intensity sampling in areas with more complex or more quickly varying microhabitat features, and lower intensity sampling in areas with uniformly varying bed topography and uniform substrate. Bed topography and substrate mapping data can be collected at a very low flow, with the only data needed at high flow being water surface elevations at the top and bottom of the site and flow and edge velocities for validation purposes. In addition, alternative habitat suitability criteria, such as measures of habitat diversity, can be used in the analysis.

Page 6.3-4, Paragraph 3 - For salmon fry and juvenile rearing, the applicant should use the Service's Sacramento River fall-run Chinook salmon habitat suitability criteria (USFWS 2005) and use our spawning sites for the habitat types that were in those sites, then select additional sites to represent the remaining habitat types. If the applicant does attempt to develop site-specific criteria for fry and juvenile rearing, they should collect cover, adjacent velocity data, unoccupied data, and develop the criteria using logistic regression. The applicant would need to collect at least 150 observations of occupied locations for each life stage to develop meaningful data analysis. The above constitutes the current state-of-the-art for developing habitat suitability criteria and are necessary to develop scientifically-defensible criteria. The use of Service spawning sites would reduce the required effort for this task.

Page 6.3.-4, Paragraph 3 - For rainbow trout, we request that the applicant model for rainbow trout for the Butte Creek Diversion Dam to Forks of Butte Diversion Dam reach. The applicant should use the habitat suitability criteria the Service developed from the South Fork American River basin (USFWS 2004) for adult and juvenile rearing, and use the Service's preliminary spawning criteria from the Yuba River for rainbow spawning. If the applicant does develop site-specific rainbow trout criteria, they should collect cover and adjacent velocity data for adult, juvenile and fry rearing, and collect unoccupied data, and develop the criteria using logistic regression. The applicant would need to collect at least 150 observations of occupied locations for each life stage to develop meaningful data analysis. The above constitutes the current state-of-the-art for developing habitat suitability criteria and are necessary to develop scientifically-defensible criteria.

Page 6.3.-4 & 5, Paragraph 3 and 1 - For spawning rainbow trout, the applicant should be modeling habitat in high-use spawning areas and expanding to the entire reach based on the percentage of spawning in the sites (versus the total reach). The Service requests that the applicant map spawning areas in Butte Creek and the West Branch of the Feather River that are affected by the project. The above represents the current state of the art for modeling spawning habitat, and is necessary to develop scientifically defensible flow-habitat relationships for spawning. The above methodology is superior to a habitat-mapping approach because it takes into account other factors, such as gravel permeability, which control the distribution of spawning (Gallagher and Gard 1999).

Page 6.3.-4, Paragraph 3 - For the Lower Centerville Diversion Dam to Centerville Powerhouse and Centerville Powerhouse to Parrot-Phelan reaches, the applicant should also map adult spring-run holding habitat (probably a reasonable definition would be areas with depths greater than 3 feet - or based on where they actually see spring-run adults holding). The above is necessary to be able to evaluate trade-offs in summer spring-run chinook salmon rearing habitat for the bypass reach versus the reach downstream of the Centerville Powerhouse.

Page 6.3.-5, Paragraph 1 - The applicant should also be conducting a 2-D IFIM flow study on the project affected reaches of the West Branch of the Feather River from Round Valley Reservoir and Dam to the Miocene Diversion (Non-Project) including Philbrook Creek downstream of Philbrook Reservoir and Dam. Flow-habitat relationships are needed for the West Branch of the Feather River and associated Project affected streams to be able to set flow requirements and develop PM&E flow measures.

Survey Benthic Macroinvertebrates in Project-Afffected Stream Reaches Using CSBP Protocols on WBFR and Tributaries:

Page 6.3-6, Paragraph 1 - The Service requests that this study should also include development of macroinvertebrate flow-habitat relationships using criteria developed by Professor James Gore (now at the University of South Florida St. Petersburg). This information will be critical to develop instream flow recommendations for tributaries with intermittent flows (USFWS 2004a).

Characterize Fish Populations in Project Reservoirs and Project -Affected Stream Reaches

Page 6.3-5, Paragraph 4 - The applicant should characterize the fish populations of all Project-affected stream reaches including all bypassed stream reaches and reservoirs. The applicant should include descriptions of aquatic habitats where fish surveys are performed which is considered standard practice. The fish population characterization and descriptions of aquatic habitats data will assist in providing information to make informed decisions regarding the management of anadromous and resident fish populations and associated habitats. Collection of this information is important for developing adequate PM&E measures for fish and aquatic resources.

"6.3.4 Wildlife Resources (Including related RT &E and Riparian, Wetland and Littoral Habitat Resources

Page 6.3-6 - The Service requests an updated "Deer Protection Facilities Inspection, Evaluation, and Monitoring Plan." In Section 6.2.4 (Pages 6.2-13 & -14 "Wildlife Resources"), the PAD mentions the Project's potential canal/flume system effects upon local deer populations. Although "actions" were taken and completed to address potential impacts to deer by 1985, all monitoring of such effects to deer were terminated in 1985 (see page 6.2-14). It appears that there has been no subsequent evaluation of deer protection facilities for over 20 years, although the applicant reports that they inspect and maintain such facilities semiannually. The Service would like an updated status report on the effectiveness of existing deer protection facilities.

Threatened and Endangered Species

5.7 Rare, Threatened, Endangered and Special Status Species.

The applicant prepared a list of rare, threatened, endangered and special status species that occurring or potentially occurring in the Project vicinity (Table 5.7-1). Several of these species are listed species, or candidates for listing, under the Endangered Species Act of 1973, as amended (Act). These species are discussed below. We request that an analysis be performed of the affects of the Project on listed species and candidate species, and their habitats, including an analysis of any cumulative effects. In addition, if listed or candidate species are located during the studies, mitigation measures should be incorporated into the Project description that will reduce or eliminate adverse impacts to these species.

Bald Eagle (*Haliaeetus leucocephalus*): According to the PAD, bald eagles are known to occur in the vicinity of Philbrook Reservoir during the fall months, and one was reported north of Magalia Reservoir on Little Butte Creek.

The Pacific Bald Eagle Recovery Plan (USFWS 1986) identifies reasons for the decline of the bald eagle, and states that habitat loss is the most significant long-term threat to bald eagle populations. Other threats to the bald eagle include recreational development and human activities affecting the suitability of breeding, wintering, and foraging areas. The California bald eagle nesting population has increased in recent years from under 30 occupied territories in 1977 to 151 occupied territories in 1999 (Jurek 2000). Based upon annual wintering and breeding bird survey data, it is estimated that between 100-300 bald eagles winter on national forests in the Sierra Nevada, and at least 151-180 pairs remain year-round to breed (USFS 2001). Most of the breeding population is found in the northern third of the state, primarily on public lands. Seventy percent of nests surveyed in 1979 were located near reservoirs (Lehman 1979) and this trend has continued, with population increases occurring at several reservoirs since the time of that study. In the Pacific recovery region, of which the Lassen National Forest is a part of, reclassification goals as set forth in the Recovery Plan (USFWS 1986) have been met. The Service recommends the use of the following documents to address the potential for impacts to bald eagles: *Pacific Bald Eagle Recovery Plan* (USFWS 1986); *Protocol for Evaluating Bald Eagle Habitat and Populations in California* (PG&E 2004)

California red-legged frog (*Rana aurora draytonii*): The California red-legged frog has sustained a 70 percent reduction in its geographic range in California as a result of several factors acting singly or in combination. Habitat loss and alteration, combined with over exploitation and introduction of exotic predators, were significant factors in the red-legged frogs' decline in the early to mid-1900s. The California red-legged frog is threatened within its remaining range by a wide variety of human impacts, including urban encroachment, construction of reservoirs and water diversions, land conversions, industrial and non-industrial forest practices, introduction of exotic predators and competitors, livestock grazing, and habitat fragmentation. Remaining aggregations (assemblages of one or more individuals, not necessarily a viable population) of California red-legged frogs in the Sierran foothills became fragmented and have been nearly extirpated by reservoir construction, continued expansion of exotic predators, grazing, and prolonged drought.

Critical habitat was proposed for the California red-legged frog on April 13, 2004 (61 FR 25813). Currently, there is no proposed designated critical habitat in the Project area.

The Service recommends the use of the following documents to address the potential for impacts to California red-legged frogs: *Recovery Plan for the California Red-legged Frog* (USFWS 2002a) and *Guidance on Site Assessment and Field Surveys for California Red-legged Frogs* (USFWS 1987) (Enclosure A).

Valley elderberry longhorn beetle (beetle) (*Desmocerus californicus dimorphus*): The beetle's current distribution is patchy throughout the remaining riparian forests of the Central Valley from Redding to Bakersfield. The beetle appears to be only locally common, i.e., found in population clusters that are not evenly distributed across the Central Valley. Extensive destruction of California's Central Valley riparian forests has occurred during the last 150 years due to agricultural and urban development. According to some estimates, riparian forest in the Central Valley has declined by as much as 89 percent during that time period. The beetle, though wide-ranging, is in long-term decline due to human activities that have resulted in widespread alteration and fragmentation of riparian habitats, and to a lesser extent, upland habitats, which support the beetle.

Critical habitat was designated for this species on August 8, 1980 (45 FR 52803). There is no designated critical habitat in the Project area for the beetle.

The Service recommends the use of the following document to address the potential for impacts to the beetle: *Valley Elderberry Longhorn Beetle Recovery Plan* (USFWS 1984), and *Conservation Guidelines for the Valley Elderberry Longhorn Beetle* (USFWS 1999).

The applicant has consulted with the Service for routine operations and maintenance activities that occur on all PG&E lands within the range of the beetle (Service file no. 1-1-01-F-0114). The incidental take statement authorized take for a term of 30 years for the beetle.

Slender orcutt grass (*Orcuttia tennuis*): Slender orcutt grass occurs in valley grassland and blue oak woodland. It grows in vernal pools on remnant alluvial fans and high stream terraces and

recent basalt flows. It has some ability to colonize artificial habitats, such as the margins of stock ponds. The species is restricted to northern California. Scattered populations occur in the Sacramento Valley from Siskiyou County to Sacramento County. Most of the 59 native extant populations are in Shasta County and Tehama County. The species is also found in Lake, Lassen, Plumas, Sacramento and Siskiyou counties. Critical habitat was designated for this species on August 6, 2003 (62 FR 14338). There is no designated critical habitat in the Project area for slender orcutt grass. A (*Draft Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon)* was published in October 2004, and includes coverage of this species (USFWS 2004b).

Layne's ragwort (*Senecio layneae*): Layne's ragwort grows in open rocky areas of gabbro and serpentine soils within chaparral plant communities. Most known sites are scattered within a 40,000 acre area in western El Dorado County that includes the Pine Hill intrusion and adjacent serpentine. A few other colonies occur in the Eldorado National Forest in El Dorado County, in the Bureau of Land Management (BLM) Red Hills Management Area in Tuolumne County, and on BLM land in Yuba County. However, most colonies are on privately owned land. There is no critical habitat designated for Layne's ragwort.

The Service recommends the use of the following document to address the potential for impacts to Layne's ragwort: *Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills* (USFWS 2002b).

Greene's tuctoria (*Tuctoria greenei*): Greene's tuctoria is restricted to small or shallow vernal pools or the early drying sections of large, deep vernal pools in the Central Valley. Its historical range included parts of Shasta, Tehama and Butte counties in the northern Sacramento Valley, and extended from San Joaquin County to Tulare County in the San Joaquin Valley. The species apparently no longer occurs in Fresno, Madera and Tulare counties. The remaining populations are in Shasta, southern Tehama, Butte, Glenn, and eastern Merced counties.

Critical habitat was designated for this species on August 6, 2003 (62 FR 14338). There is no designated critical habitat in the Project area for Greene's tuctoria. Our 12-month finding for this species contains a review of the available scientific and commercial information (68 FR 46683).

Mountain yellow-legged frog (*Rana muscosa*): On January 16, 2003, the Service determined that Sierra Nevada population of the mountain yellow-legged frog warrants protection under the Act, but that listing the species is precluded by the need to take other listing actions of a higher priority. This species is currently on our candidate species list. We will develop a proposed rule to list this population according to our listing priority system.

The Sierra Nevada population of the mountain yellow-legged frog is a separate, distinct population from the southern California population of the mountain yellow-legged frog, and comprises the remainder of the species' range. The Sierra Nevada population ranges from southern Plumas County to southern Tulare County, and extends into Nevada in the vicinity of Lake Tahoe and northward to the slopes of Mount Rose.

Mountain yellow-legged frog populations have declined by an estimated 50 to 80 percent throughout the Sierra Nevada. The 12-month finding reviewed available scientific studies and concluded that the stocking of non-native fish, disease, air pollution, and the effects of poorly-managed livestock grazing have negatively affected the frogs and their habitat. Our 12-month finding for the mountain yellow-legged frog contains a review of the available scientific and commercial information on the species (68 FR 2283).

Fisher (*Martes pennanti*): On April 7, 2004, the Service determined that a distinct population segment of the fisher (including portions of California, Oregon, and Washington) warrants protection under the Act, but that listing is precluded by higher priority listing actions. The species is currently on our candidate species list. We will develop a proposed rule to list this population according to our listing priority system. We have not designated critical habitat.

The fisher belongs to the weasel family (Mustelidae). Some researchers have recognized three subspecies of fisher: *Martes pennanti pennanti* in the east and central regions of North America, *M. p. columbiana* in central and northwestern regions and *M. p. pacifica* ("Pacific fisher") in the western region of North America. The Service does *not* recognize this distinction.
Our 12-month finding for the fisher contains a review of the available scientific and commercial information on the fisher (69 FR18769).

6.2.4 Wildlife Resources

Potential effects on wildlife habitat due to reservoirs and transmission lines. The applicant discusses the potential for Project transmission lines to affect wildlife habitat. The applicant also needs to address the potential for Project transmission lines to affect wildlife species. Transmission line operation and maintenance activities may affect birds, including bald eagles. Transmission lines and towers pose potential risks to birds. The most common risks are electrocution from perching on transmission towers and collision with wires or the transmission towers. Large size is the most crucial factor that makes certain raptor species susceptible to electrocution. The probability of spanning conductors with outstretched wings or other body parts is much greater for large birds. The likelihood of electrocutions occurring at voltages greater than 69 kV is extremely low because the spacing of the lines is wider than the wingspan of large birds (APLIC 1996).

In 4.2.3, Project Transmission of the PAD, the applicant describes the transmission system of the Project. It appears to the Service that voltages are less than 70 kV, increasing the risk for large raptors to be at risk to electrocution. The PAD does not state whether or not these transmission lines under 70 kV have retrofitted to minimize harm to raptors. To reduce the potential for impacts to raptors, the Service recommends that the use of the following documents to address the potential for impacts: *Suggested Practices for Raptor Protection on Power Lines* (Miller et al. 1975), and *Suggested practices for raptor protection on power lines – the state of the art in 1996.* (Avian Power Line Interaction Committee (APLIC 1996).

In addition to raptors, please give consideration to potential impacts to migratory birds in your analysis.

6.2.5 Botanical Resources

Potential effects on presence and spread of noxious weeds. Noxious weeds cause the loss of wildlife habitat. Dense infestations of noxious weeds can have major impacts on ecological conditions that support the existence of wildlife. These invasive non-native plants can reduce forage, alter thermal and escape cover, change waterflow and the availability to wildlife, and may reduce territorial space necessary for wildlife survival (Sheley *et al.* 2001).

6.3 Potential Studies and Information Gathering Needs by Resource

The applicant has provided a listing of potential studies and information that may be needed to evaluate preliminary issues identified in the PAD. Only a brief explanation of each proposed study was provided.

The applicant sponsored Study Plan Workshops in Chico, California on January 6, 7, 10, and 11, 2005. Prior to those meetings, the applicant supplied licensing participants with several of these potential studies that the applicant wishes to begin by the summer of 2005 to allow these studies to be completed before filing an application for new license by October 2007. The purpose of the January meetings was to review, discuss, and receive comments from licensing participants. The Service participated, and commented on several of these studies. In addition to verbal comments, the Service is including comments on the original text of the study plans, as requested by the applicant. See Enclosure B, our comments are in ***[bold, italic].***

The following are comments on the remainder of potential studies presented in the PAD. The Service would like to express the fact that these comments are limited because the applicant provided only a brief explanation of each proposed study in the PAD. Pursuant to 18 CFR § 5.12, the Service will provide additional comments within 90 days after the applicant files their proposed study plans with the Commission.

6.3.3. Fish and Aquatic Resources, Perform Visual Encounter Surveys of RT&E Amphibian Species Near Project Reservoirs and Project-Affected Stream Reaches - Depending on the time of year that surveys are conducted for California red-legged frogs, the species may be foraging, resting, or dispersing in upland areas and may not be detected by surveys. A great deal of experience, especially with nighttime surveys, is necessary to detect California red-legged frogs. Because of these difficulties associated with surveying, negative survey results do not necessarily indicate an absence of the species, even if conducted by highly qualified biologists.

Additional Service comments on this proposed study can be found in Enclosure B.

6.3.4 Wildlife Resources, Assess Bald Eagle and Peregrine Falcon Habitat and Presence in the Project Area – Regarding the peregrine falcon, the Service supports the applicant's proposal to survey for the occurrence of potential habitat. In addition, the Service recommends that the applicant monitor annually, for the life of the license, all active eyries and suitable nesting habitat located. Further, the Service recommends that the applicant, in its annual monitoring, include information regarding reproductive activity of all active sites. Regarding the bald eagle, the

Service recommends that if nesting bald eagles are located, that the applicant monitor annually, for the life of the license, the reproductive activity of each site.

Additional Service comments on this proposed study can be found in Enclosure B.

Request for Studies

The following study request has been formatted as required by CFR 18 Part 5 Integrated Licensing Process § 5.9 "Comments and information or study requests" which provides guidance for requesting studies in this phase of the relicensing process:

Study Plan Number: Requests additional Instream Flow Studies analysis to PAD Study Plan 6.3.3-2 which was proposed by the applicant.

Study Plan Name: Perform Instream Flow Studies on Butte Creek, West Branch Feather River (WBFR) and Associated Project Affected Streams

1) Goal and Objectives of Study: This study will evaluate how changes in streamflow resulting from normal Project operations affect special status and resident fish species in Project-affected waters of PG&E's DeSabla-Centerville Project, FERC No. 803 (Project). The River 2D 2-D model will be used to describe the relationship between weighted usable area (an index of available fish habitat) and stream flow.

The streamflow evaluation will provide participants in the relicensing process (Licensing Participants) information which, in combination with the water temperature model (Study Plan 6.3.2-4 Develop Water Temperature Model and Monitor Water Temperatures) and other resource studies, will provide a basis for streamflow-related resource management decisions.

2) Relevant Resource management goals of the Service:

Please see Goals and Objectives Section of this letter.

3) Requestor is a Resource Agency – N/A

4) Describe Existing Information and Need For Additional Information:

The following existing instream flow information is included in PAD, Volume 1:

- Icanberry (1979) and Steitz [1985] presented instream flow/trout habitat simulations using the Water's methodology, an early approach to instream flow/habitat modeling.
- FWS (2003) used a 2-D hydraulic and habitat model to evaluate the spawning habitat flow relationship for spring-run Chinook salmon in the Project-affected reaches of Butte Creek below LCDD.

- Dunn and Roberts [1984] presented an IFG-4 instream flow study for the WBFR below Hendricks Head Dam, in a section downstream of flow accretion from Big Kimshew Creek and other tributaries.
- In 1982 Licensee conducted an instream flow study to evaluate spring-run Chinook spawning habitat using the 1-D IFG-4 hydraulic model [PG&E, unpublished data].*

*The Service does not recommend using this data because it is not state-of-the-art data for developing habitat studies.

5) Nexus Between Project Operations and Effects on The Resources To Be Studied

The Project diverts water from Butte Creek and the West Branch Feather River and discharges the combined water at DeSabla and Centerville powerhouses. This pattern of diversion and discharge and resulting periodic change in flows has the potential to affect the quantity and quality (as measured by depths and velocities) of aquatic habitats. These flow-related changes in habitat may affect the distribution, behavior and/or numbers of fish and aquatic species and their life stages in Project-affected reaches. Assessing the quantity and quality of flow-related aquatic habitat as it pertains to Butte Creek, West Branch Feather River and associated (project affected) tributaries fisheries is essential for determining flow management options for the Project during relicensing. The results of this study will augment the existing streamflow-habitat information that has been collected for Butte Creek and assist assessment of the adequacy of existing protection, mitigation, and enhancement measures (PM&Es) for resident and special status fish species, especially Central Valley spring-run Chinook salmon and Central Valley steelhead (steelhead), and resident fish species in West Branch Feather River and associated tributaries affected by the Project.

6) Explain how proposed study methodology and schedule is consistent with generally accepted practice in the scientific community:

The Service recommends that 2-D modeling be done instead of 1-D IFG-4a modeling in the Project affected reaches of Butte Creek, the West Branch of the Feather River and associated tributaries affected by the Project. The 2-D model avoids problems of transect placement, since the entire site can be modeled. The 2-D model also has the potential to model depths and velocities over a range of flows more accurately than PHABSIM because it takes into account upstream and downstream bed topography and bed roughness, and explicitly uses mechanistic processes (conservation of mass and momentum), rather than Manning's n and a velocity adjustment factor. Other advantages of 2-D modeling are that it can explicitly handle complex habitats, including transverse flows, across-channel variation in water surface elevations, and flow contractions/expansions. The model scale is small enough to correspond to the scale of microhabitat use data with depths and velocities produced on a continuous basis, rather than in discrete cells. The 2-D model does a better job of representing patchy microhabitat features, such as gravel patches. The data can be collected with a stratified sampling scheme, with higher intensity sampling in areas with more complex or more quickly varying microhabitat features, and lower intensity sampling in areas with uniformly varying bed topography and uniform substrate. Bed topography and substrate mapping data can be collected at a very low flow, with the only data needed at high flow being water surface elevations at the top and

bottom of the site and flow and edge velocities for validation purposes. In addition, alternative habitat suitability criteria, such as measures of habitat diversity, can be used.

Habitat mapping should be conducted in summer 2005; study sites should be selected and established when the results of the habitat mapping effort are complete (approximately fall 2005). Transects within each study site should be established following the study site selection (approximately fall 2005). Baseflow hydraulic data at each transect in the habitat-specific study sites may also be collected at this time. High flow information should be collected during the spring 2006 runoff period. If baseflow hydraulic data were not collected in 2005, then it would be collected during the low flow period (July-September) of 2006.

Identification of the fish species and life-stages to be assessed in the IFIM analysis should be decided in coordination with the resource agencies. This decision should be completed by the end of summer 2005. Licensee currently proposes to assess habitat for yearling spring run Chinook salmon, steelhead spawning, juvenile steelhead, and fry, juvenile, rainbow trout (spawning, juvenile and adult) and adult hardhead. An instream flow study evaluating spring run Chinook salmon spawning habitat has already been completed by the Service, 2003. The Service does not recommend using unpublished data provided by the applicant on spring run Chinook salmon (PG&E, 1982) because it is not state of the art data for developing habitat studies. At this time,PG&E does not propose to conduct a reassessment of spring run Chinook salmon spawning. Development of Habitat Suitability Criteria (given that the species and life-stages for analysis have been selected) should begin in fall 2005, and if after 1 year, sufficient observations to develop site-specific data have not been collected, then existing, published suitability curves should be selected in consultation with the resource agencies. The data analysis and report preparation would begin.

7) Explain level of effort and cost and why proposed alternative studies are insufficient.

A 2-D IFIM should be about the same level of effort and cost as a 1-D PHABSIM study if the applicant uses enough PHABSIM transects (i.e. 40 transects per reach). The Service recommends using 40 transects per reach based on Gard (2005). This study found that 40 transects for juvenile salmonids would result in a 95 percent confidence limit for the flow at the peak of the curve of plus or minus 25 percent. We believe that this level of accuracy is necessary in this case to get reliable results, given the presence of listed species (spring-run Chinook salmon and steelhead trout).

The Service recommends that 2-D modeling be done instead of 1-D IFG-4a modeling. The 2-D model avoids problems of transect placement, since the entire site can be modeled. The 2-D model also has the potential to model depths and velocities over a range of flows more accurately than PHABSIM because it takes into account upstream and downstream bed topography and bed roughness, and explicitly uses mechanistic processes (conservation of mass and momentum), rather than Manning's n and a velocity adjustment factor. Other advantages of 2-D modeling are that it can explicitly handle complex habitats, including transverse flows, across-channel variation in water surface elevations, and flow contractions/expansions. The model scale is small enough to correspond to the scale of microhabitat use data with depths and velocities produced on a continuous basis, rather than in discrete cells. The 2-D model does a better job of

representing patchy microhabitat features, such as gravel patches. The data can be collected with a stratified sampling scheme, with higher intensity sampling in areas with more complex or more quickly varying microhabitat features, and lower intensity sampling in areas with uniformly varying bed topography and uniform substrate. Bed topography and substrate mapping data can be collected at a very low flow, with the only data needed at high flow being water surface elevations at the top and bottom of the site and flow and edge velocities for validation purposes. In addition, alternative habitat suitability criteria, such as measures of habitat diversity, can be used.

In addition the Service requests the following studies for the relicensing process:

1) Entrainment of Fish in Project Facilites Affecting National Forest Resources (submitted by U.S. Forest Service (FS);
2) Risk Assessment of Facility Failure (submitted by FS);
3) FS Sensitive Mollusk Survey (submitted by FS).

SD1

On October 19, 2004, the Commission issued a Notice of Scoping Meetings and Soliciting Scoping Comments in the Project. The Service provides the following comments on the geographical and temporal scope of the Commission's proposed environmental analysis, and the resource issues to be addressed in the environmental assessment that the Commission plans to prepare for this Project.

1.0 Introduction, Paragraph 1, Sentence 1- The Service requests that the Commission consider issuing a 30- in lieu or a 40- or 50-year license for the Project. This will allow to re-evaluate Project effects on fish and wildlife resources, including special status species, in a more timely fisheries. The Service would also like to reexamine the cumulative effects of related energy projects from a watershed approach in the near future.

1.0 Introduction, Paragraph 3, Sentence 2- At this time, Commission staff intend to prepare a "single EA" for this project (i.e. no draft EA will be issued). The Service requests that the Commission issue a draft EA to allow interested parties an opportunity to respond to the environmental analysis and provide review and input into the environmental document. There are many issues regarding special status species for this relicensing and providing opportunity to comment on a draft EA will allow interested individuals an opportunity to coordinate PM&E measures and review and comment on related fish and wildlife issues.

4.0 Proposed Action and Alternatives- The Service requests that the Commission consider evaluating a fourth alternative in its environmental analysis which would be an alternative potentially developed by the resource agencies and collaborative workgroup.

5.1 Cumulative Effects, Page 11- The Service requests that cumulative effects to fisheries and aquatic resources, including the federally listed spring-run Chinook salmon and steelhead trout be included as resources that have the potential to be cumulatively affected by the continued

operation of the Project in combination with other activities in the Butte Creek and West Branch Feather River basins.

5.1.1 Geographic Scope – The Service requests that a detailed map be provided that visually defines the physical limits or boundaries of the proposed action's effects on the resources.

5.1.2 Temporal Scope- The Service requests that the new license term temporal scope be limited to 30 years due to the sensitive nature of the area for fish and aquatic resources, wildlife and special status species.

5.2 Resource Issues – In this section, the Commission present a preliminary list of environmental issues to be addressed by the EA. The Service requests that the Commission add the following issues in their analysis to assist the Service in our analysis of Project effects to fish and wildlife resources.

Under 5.2.2 Aquatic Resources:

- Effects of noxious weeds on aquatic habitat, including Project reservoirs, Project-affected stream reaches, and riparian, wetland, and littoral habitats.

- Potential for enhancement of minimum flows for improving aquatic habitat and fish and macroinvertebrate populations in the project reservoirs and project- affected stream reaches.

- Effects of out of season pulse flows for recreation on fish and aquatic resources.

Under 5.2.3 Terrestrial Resources:

- Effects of transmission lines on migratory birds.

The Service appreciates the opportunity to comment during the planning stages of the Project. If you have any questions regarding this response, please contact Deborah Giglio of my staff at (916) 414-6600.

Sincerely,

David L. Harlow
Acting Field Supervisor

Enclosures

cc:
FERC #803 Service list, DeSabla-Centerville Project

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Enclosure A

Guidance on Site Assessment and Field Surveys for California Red-legged Frogs (*Rana aurora draytonii*) U.S. Fish and Wildlife Service

February 18, 1997

I. Introduction

A final rule determining threatened status for the California red-legged frog (*Rana aurora draytonii*) under the Endangered Species Act of 1973, as amended (Act), was published on May 23, 1996 (61 *Federal Register* 25813) and became effective on June 24, 1996. Since then the United States Fish and Wildlife Service (Service) has received numerous requests from private and government entities for guidance in planning for the protection of the California red-legged frog at the sites of proposed developments or of other land use activities. This document provides guidance for two procedures to accurately assess California red-legged frog status in the vicinity of a Project site: (1) an assessment of California red-legged frog locality records and potential California red-legged frog habitat in and around the Project area; and (2) focused field surveys of aquatic habitats to determine whether California red-legged frogs are present. Both procedures may be recommended because California red-legged frogs are mobile and, during different life history stages or different seasons of the year, may occupy a variety of aquatic and upland habitats. Both procedures should be incorporated into any assessment of the potential effects of Projects on California red-legged frogs, unless field surveys are determined to be unnecessary based on the site assessment (see "Interpreting the results of the site assessment" section).

Ongoing contact and discussions with the Service before, during, and after site assessments and field surveys are a crucial element of this guidance. Results of the site assessment and field survey should also be reported to the Service (see "Reporting the results" sections below); however, results of the site assessment should be reported prior to proceeding with field surveys. The addresses and phone numbers of the appropriate field office are provided in section V below.

II. Site Assessment

Careful evaluation of the following information about California red-legged frogs and their habitats in the vicinity of projects or other land use activities is important because this information indicates the likelihood that California red-legged frogs may occur on the Project site.

Protocol

1. Is the project site within the range of the California red-legged frog?

Because knowledge of the distribution of the California red-legged frog is likely to change as new locality information becomes available, surveyors should contact the appropriate Service field office (see section V below) to determine if a project site is within the range of this species.

2. What are the known localities of California red-legged frogs within the project site and within 8 kilometers (km) (five miles) of the project boundaries?

The surveyor should consult the Natural Diversity Data Base (NDDB) maintained by the California Department of Fish and Game's Natural Heritage Division to determine known localities of California red-legged frogs. Information on the NDDB is attached to the end of this document. Other information sources on local

occurrences of California red-legged frogs should be consulted. These sources may include, but are not limited to, biological consultants, local residents, amateur herpetologists, resource managers and biologists from municipal, State, and Federal agencies, environmental groups, and herpetologists at museums and universities. The surveyor should report to the Service all known California red-legged frog localities within the project site and within 8 km of the project boundaries.

3. What are the habitats within the project site and within 1.6 km (one mile) of the project boundaries?

Describe the upland and aquatic habitats within the project site and within 1.6 km of the project boundaries. The aquatic habitats should be mapped and characterized (e.g. ponds vs. creeks; pool, riffle, root ball, vegetation) The information provided in section 4 of the attached appendix serves as a guide to the features that will indicate possible California red-legged frog habitat.

Reporting the results of the site assessment. Surveyors should prepare a report that includes the following: photographs of the project site, survey dates and times, names of surveyors, a description of the methods used, and a map of the site showing habitat as requested in section II(3) above. The report should include copies of those portions of the 7.5' topographic quads that contain the site and the area within 1.6 km of its boundaries. A list of California red-legged frog localities as requested in section II(2) above should be included. The report should be provided to the appropriate Service field office (see section V below).

Interpreting the results of site assessment. After completing elements 1-3 of the site assessment above, the appropriate Service field office should be contacted for technical assistance. Based on the information provided from the site assessment, the Service will provide guidance on how California red-legged frogs should be addressed, including whether field surveys are needed or whether incidental take authorization should be obtained through section 7 consultation or a section 10(a)(1)(B) permit pursuant to the Act. A protocol for field surveys is presented below.

III. Field surveys

Frogs can be detected opportunistically in various habitats depending on weather and time of year. Aquatic sampling during the summer months is a reliable method of detecting frogs. Care should be taken to apply a level of effort and to use a style of surveying appropriate to the site. For instance, survey methods may differ according to habitat extent and type (e.g. deep pond, shallow pond, creek). In addition, field work should be conducted according to the best professional judgement of the surveyor (e.g. dogs should not be brought on surveys as they disturb frogs). The Service recommends that surveyors have field experience in the identification of California amphibians. The Service is willing to cooperate with surveyors who have specific needs not addressed by this field survey protocol and who may wish to propose alternative methods.

Protocol

1. Surveys should be conducted between May 1 and November 1. These sampling dates were selected because they allow surveys to be conducted with minimal disturbance of breeding frogs, eggs, or tadpoles during a period when frogs can be reliably detected.

2. All aquatic habitat identified during the site assessment should be surveyed four times, twice during the day and twice at night. Surveyors should wait at least twenty-four hours and possibly longer, to meet the environmental conditions described in section III(3) below, before repeating surveys at the same site.

3. Day-surveys should be conducted on clear, sunny days. Night-surveys should be conducted on warm, still nights between one hour after sunset and 12 midnight. Warm, still nights are preferable for surveying because the probability of observing frogs tends to decrease under cold, windy conditions. In some circumstances where safety issues preclude night-surveys, the Service can provide alternatives to the surveyor on a case-by-case basis to ensure that safe surveys are conducted.

4. Surveyors should work along the entire shore (either on the bank or in the water), visually scanning all shoreline areas in all aquatic habitats identified during the site assessment. This methodology should be applied to both day- and night-surveys. In the case of water bodies covered with floating vegetation such as duckweed, both the shoreline and surface of the water should be scanned. When wading, surveyors should take maximum care to avoid disturbing sediments, vegetation, and any visible larvae. When walking on the bank, surveyors should take care to not crush root balls, overhanging banks, and stream side vegetation that might provide shelter for frogs.

5. When conducting night-surveys for eyeshine, flashlights and headlamps that use one 6-volt or four to six D-cell batteries are recommended. High-powered spotlights are prohibited to avoid harming frogs.

6. Although not required, photographs of frogs observed during field surveys may aid in verification of species identifications. Surveyors should limit photography to the extent necessary to document the presence of California red-legged frogs and should not attempt to photograph frogs if this is likely to disturb them.

Reporting the results of field surveys. Any information on California red-legged frog distribution resulting from field surveys should be sent to the Natural Diversity Data Base (NDDB) administered by the Natural Heritage program of the California Department of Fish and Game. Information about the NDDB is attached to the end of this document. Copies of the NDDB form should be mailed immediately to both the Service and CDFG.

Surveyors should also prepare a final report that includes the following: copies of all field notes, data sheets, photographs of the project site and of frogs observed, and a typed summary providing survey dates and times (both begin and end times), names of surveyors, temperature (water and air), wind speed, a description of the methods used, numbers and size classes of all amphibians observed, a map of the site showing survey locations, habitat and frog sightings, a copy of the NDDB form, and a description of possible threats to California red-legged frogs observed at the site. The report should be provided to the appropriate Service field office (see section V below).

Interpreting the results of field surveys. Based on the results of field surveys, the Service will provide guidance on how California red-legged frog should be addressed. If California red-legged frogs are found, the Service will work with the project proponent through the section 7 or section 10(a)(1)(B) process to determine a further course of action, including the consideration of avoidance or minimization measures and whether incidental take authorization is needed. If frogs are observed but not identified to species, additional survey effort may be recommended. If the Service recommended that field surveys be conducted and if California red-legged frogs were not identified during these field surveys conducted according to this protocol, the Service will consider the California red-legged frog not to be present on the project site and will not recommend any further take avoidance or mitigation measures. The Service may question the results of field surveys conducted under this protocol for any of the following reasons: 1) if the appropriate Service field office was not contacted prior to field surveys being conducted; 2) if field surveys were conducted in a manner inconsistent with this protocol; 3) if field surveys were incomplete; or 4) if the reporting requirements, including submission of NDDB forms, were not fulfilled.

IV. Statement on permitted activities.

This field survey protocol allows for conducting visual surveys for California red-legged frogs. Surveys following this protocol do not require a section 10(a)(1)(A) recovery permit pursuant to the Act. Activities that would require a section 10(a)(1)(A) recovery permit include: 1) any capture or handling of California red-legged frog adults, larvae, or eggs; 2) any activity intended to significantly modify the behavior of California red-legged frogs; 3) any activity that subjects California red-legged frogs to some environmental condition not naturally present (e.g. experiments designed to study a frog's response to heat, moisture, noise) other than low-level illumination for night surveys as described in section III(5); and

4) any survey methods not covered in this field survey protocol if any form of "take" would occur during such activities. All surveyors using this field survey protocol should make all possible efforts to avoid unintentionally disturbing California red-legged frogs or their habitat. Surveyors should direct inquiries about section 10(a)(1)(A) recovery permits to the Service's Regional Office (see section V below).

V. Service Contacts

For project sites and land use activities in Santa Cruz, Monterey, San Benito, San Luis Obispo, Santa Barbara, and Ventura Counties, portions of Los Angeles and San Bernardino Counties outside of the Los Angeles Basin, and portions of Kern, Inyo and Mono Counties east of the Sierra Crest and south of Conway Summit, contact:

Ventura Field Office
2493 Portola Road, Suite B
Ventura, California, 93003
(805) 644-1766

For project sites and land use activities in all other areas of the state south of the Transverse Ranges, contact:

Carlsbad Field Office
2730 Loker Avenue West
Carlsbad, California, 92008
(619) 431-9440

For project sites and land use activities in all other areas of the state, contact:

Sacramento Fish & Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825
(916)414-6600

For information on section 10(a)(1)(A) recovery permits, contact:

U.S. Fish & Wildlife Service
Pacific Region
Eastside Federal Complex 911
N.E., 11th Avenue
Portland, Oregon 97232-4181
(503) 231-6241

Appendix
California red-legged frog ecology and distribution.

1. Identification

The California red-legged frog Rana aurora draytonii is a relatively large aquatic frog ranging from 4 to 13 centimeters (cm) (1½ to 5 inches) from the tip of the snout to the vent. From above the California red-legged frog can appear brown, gray, olive, red or orange, often with a pattern of dark flecks or spots. The skin usually does not look rough or warty. The back of the California red-legged frog is bordered on either side by an often prominent dorsolateral fold of skin running from the eye to the hip. The hind legs are well-developed with large webbed feet. A cream, white, or orange stripe usually extends along the upper lip from beneath the eye to the rear of the jaw. The undersides of adult California red-legged frogs are white, usually with patches of bright red or orange on the abdomen and hind legs. The groin area can show a bold black mottling with a white or yellow background.

California red-legged frog tadpoles range from 14 to 80 millimeters (mm) (½ to 3 1/4 inches) in length. They are generally brownish with darker marbling and lack distinct black or white spotting or speckling. Large California red-legged frog tadpoles often have a wash of red coloration on their undersides.

Positive diagnostic marks should be used to accurately distinguish California red-legged frogs from other species of frogs that may be observed. A positive diagnostic mark is some attribute of the animal that will not be found on any other animal one might expect to encounter at the same locality. The following features are positive diagnostic marks that, if observed, will distinguish California red-legged frogs from yellow-legged frogs Rana boylii and bullfrogs *Rana catesbeiana*:

a. Prominent dorsolateral folds (thick upraised fold of skin running from eye to hip) on any frog greater than 5 cm long from snout to vent. Young yellow-legged frogs can show reddish folds; these usually fade as the frogs attain maturity.

b. Bright red dorsum.

c. Well defined stripe as described above running along upper lip.

Because California red-legged frogs are often confused with bullfrogs, surveyors should note those features that might be found on bullfrogs that will rarely be observed on California red-legged frogs. These features are:

a. Bright yellow on throat.

b. Uniform bright green snout.

c. Body length greater than 15 cm (6 inches).

d. Tympanum (ear disc) distinct and much larger than eye.

Please note that some frogs may lack all of the above characteristics given for both California red-legged frogs and bullfrogs. Surveyors should regard such frogs as "unidentified."

California red-legged frogs are cryptic because their coloration tends to help them blend in with their surroundings, and they can remain immobile for one half hour or more. When an individual California red-legged frog is disturbed, it may jump into the water with a distinct "plop." The California red-legged frog may do this either when the surveyor is still distant or

when a surveyor is very near. Bullfrogs exhibit similar behavior but will often emit a "squawk" as they dive into the water. Because a California red-legged frog is unlikely to make such a sound, a "squawk" from a fleeing frog will be considered sufficient to positively identify the frog as a bullfrog.

2. Reproduction

California red-legged frogs breed during the winter and early spring from late November through April. Adults engage in complex courtship behaviors that result in the female depositing from 2,000 to 6,000 eggs, each measuring between 2 and 3 mm. California red-legged frog eggs are typically laid in a loose mass attached to emergent vegetation near the surface of the water body, where they can be easily dislodged. Eggs hatch within 6 to 14 days after deposition at which time the newly hatched tadpoles are delicate. California red-legged frog tadpoles transform into juvenile frogs in 3.5 to 7 months.

3. Movement

California red-legged frogs may move up to 1.6 km (one mile) up or down a drainage and are known to wander throughout riparian woodlands up to several dozen meters from the water. On rainy nights California red-legged frogs may roam away from aquatic sites as much as 1.6 km. California red-legged frogs will often move away from the water after the first winter rains, causing sites where California red-legged frogs were easily observed in the summer months to appear devoid of this species.

4. Habitat

California red-legged frogs occur in different habitats depending on their life stage and the season. All life history stages are most likely to be encountered in and around breeding sites, which are known to include coastal lagoons, marshes, springs, permanent and semipermanent natural ponds, ponded and backwater portions of streams, as well as artificial impoundments such as stock ponds, irrigation ponds, and siltation ponds. California red-legged frog eggs are usually found in ponds or in backwater pools in creeks attached to emergent vegetation such as Typha and Scirpus. California red-legged frog tadpoles remain in these habitats until metamorphosis in the summer months. Young California red-legged frogs can occur in slow moving, shallow riffle zones in creeks or along the margins of ponds. In the summer, older California red-legged frogs are often found close to a pond or a deep pool in a creek where emergent vegetation, undercut banks, or semi-submerged root balls afford shelter from predators. Older California red-legged frogs may also take shelter in small mammal burrows and other refugia on the banks up to several dozen meters from the water any time of the year and can be encountered in smaller, even ephemeral bodies of water in a variety of upland settings. California red-legged frogs are frequently encountered in open grasslands occupying seeps and springs. Such bodies may not be suitable for breeding but may function as foraging habitat or refugia for wandering frogs. Creeks and ponds where California red-legged frogs are found often have dense growths of woody riparian vegetation, especially willows (Salix sp.). The absence of Typha, Scirpus, and Salix at an aquatic site does not rule out the possibility that the site provides habitat for California red-legged frogs, but the presence of one or all of these plants is an important indicator that the site may provide foraging or breeding habitat for California red-legged frogs.

Enclosure B
Comments on PG&E Study Plans
(FWS comments on original study plans from PG&E are in ***[bold, italic]***

Study Plan 6.3.3-3

PERFORM VISUAL ENCOUNTER SURVEYS OF RT&E AMPHIBIAN SPECIES NEAR PROJECT RESERVOIRS AND PROJECT AFFECTED STREAM REACHES

DRAFT - December 28, 2004

GOALS AND OBJECTIVES OF STUDY

This study will provide information relating to the presence of amphibian and aquatic reptile RT&E1 species or their habitat within Pacific Gas and Electric Company's (PG&E's or Licensee's) DeSabla-Centerville Hydroelectric Project, FERC No. 803 (Project) Area (Project Area2). The study will provide baseline information for characterizing potential aquatic habitats, presence, distribution, and relative abundance of RT&E amphibian and reptile species that may be affected by Project operations. Amphibian surveys for RT&E species at and around Project-affected reservoirs and stream reaches will also be used by the USFS to prepare documents analyzing PG&E's Application for New License (License Application).

NEXUS BETWEEN PROJECT AND RESOURCE TO BE STUDIED AND HOW THE RESULTS WILL BE USED

Project diversions and reservoirs have the potential to affect environmental conditions within all aquatic habitats, including the associated riparian habitats. Operations therefore have the potential to affect the distribution, abundance, and structure of the local aquatic amphibian and reptile communities. Information produced by this study will allow participants in the licensing process (Licensing Participants3) to assess the potential influences of Project operations on amphibians and aquatic reptile RT&E species and assess the adequacy of existing protection, mitigation, and enhancement measures (PM&Es).

STUDY AREA

The study area to be surveyed for potential habitat will include Project-affected reservoirs and stream reaches, and the area within 0.5 miles of the normal high water line of all stream banks and reservoirs.*[The Service requests that PG&E adds: "Isolated ponds, lakes and meadows should also be added for California red-legged frog"]* The study area may be extended beyond 0.5 miles along perennial tributary streams and selected ephemeral tributaries with permanent pools if suitable habitat for the RT&E species is accessible to the species from habitat in the Project-affected water features. *[Service Guidance on Site Assessment and Field Surveys(Enclosure A) recommends that habitats within the project site and within 1.6 km (one mile) of the project boundaries be identified. California red legged frogs are known to disperse up to 1 to 2 kilometers (0.6 to 1.3*

1 RT&E species as defined in PG&E's DeSabla-Centerville Hydroelectric Project, FERC Project No. 803, Pre-Application Document (PAD), Volume 1 – Public Information, dated October 4, 2004.

2 Project Area as defined in PG&E's PAD, Volume 1, dated October 4, 2004.

3 FERC, Federal and state resource agencies, local governments, Indian tribes, members of the public, and others likely to be interested in the licensing proceeding

miles) during rain events. Therefore, for the California red-legged frog, the study area should be extended to one mile.]

The Project-affected reservoirs and stream reaches in the Butte Creek watershed include: DeSabla Forebay, Butte Creek between Butte Creek Diversion Dam and Lower Centerville Diversion Dam, Butte Creek between Lower Centerville Diversion Dam and Centerville Powerhouse, Butte Creek between Centerville Powerhouse and Parrot-Phelan Diversion Dam (a non-Project structure), and tributary streams to Butte Creek downstream of feeder diversions associated with Butte Canal and Lower Centerville Canal.

The Project-affected reservoirs and stream reaches in the West Branch Feather River (WBFR) watershed include: Round Valley Reservoir (also called Snag Lake), Philbrook Reservoir, WBFR between Round Valley Reservoir and Hendricks Head Dam, WBFR between Hendricks Head Dam and the Miocene Diversion (a non-Project structure), Philbrook Creek between Philbrook Reservoir and Butte Creek, and tributaries downstream of feeder diversions associated with Hendricks Canal.

[As noted above, the Service requests that PG&E adds: "isolated ponds, meadow, and lakes should be added to habitat to be assessed, within one mile of project boundaries"]

STUDY SITES

Potential study sites will be identified using aerial photographs, topographic maps, helicopter reconnaissance, ground-truthing, and preliminary habitat assessments. Habitat quality of each potential study site identified in the study area will be based on the presence of suitable habitat characteristics for the target species (see Table 1, under the *Methods* section below). The individual selection of study sites for focused surveys will take into account site-specific information including habitat quality or value, species-specific habitat criteria, safety and access issues, and potential impact from Project operations.

SCHEDULE

To the extent feasible, all identification of potential habitat and final survey site selection will be completed in 2005. Surveys for amphibian and aquatic reptile RT&E species will be conducted during spring and summer of 2006. The results of these surveys will be reviewed with Licensing Participants, and a determination will be made as to the need for any additional surveys in 2007.

METHODS

This study is divided into three phases to facilitate the development of species-specific information and habitat criteria, to identify potential study sites, and to standardize methods used to evaluate habitat characteristics and conduct formal surveys. The types of information to be collected and tasks to be completed during each phase are described below.

Phase One – Compile and Review Existing Information

- A list of amphibian and reptile RT&E species occurring or potentially occurring in the Project Vicinity4 (PAD, Volume 1, dated October 4, 2004, Table 5.7-1) was compiled and includes life history and habitat information for each species. Five of the amphibian and aquatic reptile RT&E species with a reasonable potential to occur in the Project Area are the proposed as the "target species" of the amphibian and aquatic reptile RT&E species survey and have been identified in Table 1 below. Only one of these, the California red-legged frog, is listed (threatened) under the Federal Endangered Species Act (ESA). It should be noted that the northern leopard frog, which was included in Table 5.7-1 of the PAD, Volume 1, as a RT&E species that could potentially occur in the Project Vicinity, has not been included as a target species in this study plan due to its low probability of occurrence. The preferred aquatic habitat and elevation range of the five target species is provided in Table 1.

- The Licensee will conduct follow-up discussions with Licensing Participants and experts from other organizations, and will review any other information sources for updates to the information collected during preparation of the PAD, Volume 1, and this study plan regarding occurrence of amphibian and aquatic reptile RT&E species in the Project Area. At the FERC scoping meeting on November 17, 2004, the USFS indicated that adequate amphibian surveys had already been conducted in the WBFR upstream of Hendricks Head Dam. If during study development, the U.S. Fish and Wildlife Service (FWS) agrees with this assessment, then the scope of this proposed study plan will be modified to exclude the Project Area upstream of Hendricks Head Dam ***[The USFS (Ken Roby, Fisheries Biologist, 1/7/05) informed the Service that only federal lands were surveyed upstream of Hendricks Head Dam, and that federal lands only make up a small percentage of the land ownership in that area. Therefore, habitat upstream of Hendricks Head dam within one mile of the project would need to have CRLF habitat assessed, where the project is below 5,000 ft. The Service realizes that PG&E may not have access to some of the private lands that will be assessed.]***

4 Project Vicinity as defined in PG&E's PAD, Volume 1, dated October 4, 2004.

Table 1. Preferred aquatic habitat and general elevation range of aquatic amphibian and reptile RT&E species with potential to occur in the Project Area.

Species	Preferred Habitat	Elevation Range
California red-legged frog *Rana aurora draytonii*	Wetlands, Wet Meadows, Ponds, Lakes, Pools, and Low Gradient, Slow-Moving Stream Reaches	Below 5,000 ft
Foothill yellow-legged frog *Rana boylii*	Rocky Streams	Below 5,000 ft
Mountain yellow-legged frog *Rana muscosa*	Wet Meadows, Lakes, Ponds, and Low Gradient, Slow-Moving Stream Reaches	Above 5,000 ft
Cascade frog *Rana cascadae*	Wet Meadows, Lakes, Ponds, Slow-Moving Streams	Below 8,000 ft
Northwestern pond turtle *Emys marmorata marmorata*	Lakes, Ponds, and Low Gradient, Slow-Moving Stream Reaches	Below 5,000 ft

Phase Two – Identify Potential Habitat and Select Survey Sites

- The Licensee will identify sites within the study area where potential habitat for the target species may occur using aerial photographs and USGS 7.5 minute topographic maps. All potential habitat sites will be given a number and will be denoted on topographic maps. The Licensee will then conduct field reconnaissance (utilizing helicopter and on-the-ground methods) to locate and document potential habitat locations within the study area. Helicopter reconnaissance flights will be used in conjunction with aerial photos and maps to verify potential sites previously identified, and to document new sites with potential habitat for the target species. During the helicopter reconnaissance, potential sites will be logged by GPS position; photographs will be taken of each site from various angles; and a preliminary habitat assessment will be conducted. Pertinent habitat characteristics to be recorded during helicopter surveys will include: flow regime (perennial or ephemeral), primary habitat features such as aquatic and terrestrial vegetation (e.g., emergent, overhanging, and canopy), gradient, aquatic substrate, and stream channel characteristics. Some locations may need to be ground-truthed based on information gathered during helicopter surveys.

- After determining the location and habitat characteristics of potential aquatic survey sites within the study area, data obtained on each site will be used to group sites with similar habitat characteristics, and to determine potential suitability or quality of each habitat to support the target species. The suitability or quality of potential habitat at each site will be evaluated using available information on species-specific habitat criteria (Table 1), habitat characteristics (Jennings and Hayes 1994, Stebbins 2003) documented on other rivers in the Sierra ***(Pacific Gas and Electric Company 2001, Pacific Gas and Electric Company and EA Engineering 2001, GANDA 2002a, GANDA 2002b, GANDA 2003a, GANDA 2004a, GANDA 2004b, GANDA 2004c),*** and the knowledge and experience of local species experts and Licensee biologists. Each potential site will be given a habitat rating (i.e., high, moderate, low, or none) according to the presence of species-specific habitat criteria. Habitat that appears to be of moderate-to-high

quality for the target species will be selected for initial surveys. Based on these surveys, the initial evaluation of the site habitat quality (moderate to high) will be confirmed or modified, and a list of sites for focused surveys will be generated.

Phase Three – Conduct Surveys

- Formal visual encounter surveys (VESs) will follow the methods of current, species-specific survey protocols as described under the *Consistency with Generally Accepted Scientific Practice* section below. The survey methods will provide a focused and standardized approach for assessing habitat characteristics and determining the presence, distribution, and relative abundance of target species, as well as provide data for evaluating potential effects of Project operations on amphibian and aquatic reptile RT&E species habitat. ***[The Service requests that PG&E add: "If suitable habitat is located for the California red-legged frog, then Service protocol level surveys must be conducted for this species. This protocol consists of day and night visits".]***

ANALYSIS

Based on data collected during this study and other available information, descriptions of the general physical and biological characteristics of areas identified as potential habitat will be prepared. Maps will be prepared showing the locations of potential habitat, sites selected for VESs, and life stages of each species encountered during VESs. Relative abundance data, as a measured value of number of individuals over time and area surveyed, will be calculated for each life stage (number of larvae will be estimated).

CONSISTENCY WITH GENERALLY ACCEPTED SCIENTIFIC PRACTICE

The study methodology proposed for this study plan is consistent with the generally accepted practice in the scientific community. The proposed methodologies utilize standard survey techniques that have been employed by the Licensee in previous relicensing projects. The survey methods employed will depend on the target species identified for the study and may include techniques described in *Survey Protocols, Standard Operating Procedures, and Data Sheets for Amphibian Surveys and Habitat Assessments* (Pacific Gas and Electric 2001) [***The Service could not locate a copy of this protocol prior to commenting on this study***], *A Standardized Approach for Habitat Assessments and Visual Encounter Surveys for the Foothill Yellow-Legged Frog (Rana boylii)* (Seltenrich and Pool 2002), and *Western Pond Turtle Survey Techniques* by Holland and modified by Reese (1991), [***The Service requests that PG&E add: and Guidance on Site Assessment and Field Surveys for California Red-legged Frogs (USFWS 1997).]***

[Alicia Pool (PG&E) and Craig Seltenrich (ECORP Consulting Inc.) presented to the Declining Amphibian Task Force Working Group meeting on January 14, 2005: Habitat Variability Observed at Foothill Yellow-legged Frog (Rana boylii) Breeding Locations in Several Large River Drainages along the Western Slope of the Sierra Nevada: Implications for Developing Survey Strategies. They recommended, "when designing studies in the Sierras, the selection of survey sites should include a relatively wide array of habitat types, especially if traditional breeding habitat is in limited supply, or if the seasonal flow regime is altered or regulated by dams or

hydroelectric projects". The Service requests that PG&E take this information into account when designing the study methodology.]

PRODUCTS

Study plan reporting requirements (initial and updated study reports and meetings) will be conducted within the timeframes set forth in 18 CFR § 5.15. Periodic progress reports will be provided to Licensing Participants semi-annually. At the conclusion of the study, a report will be produced assessing habitat characteristics and determining the presence, distribution, and relative abundance of the survey target species, and provide data for evaluating potential effects of Project operations on amphibian and aquatic reptile RT&E species habitat. The report will be included as part of Licensee's Application for New License, Exhibit E.

HOW THE RESULTS WILL BE USED

The results of the study will allow the Licensee and Licensing Participants to assess the potential influences of Project operations on amphibian and reptile RT&E species presence, distribution, and abundance within the Project Area.

Based upon further consultations with the resource agencies, the Study results may also be used to plan additional studies that would evaluate impacts of various stream flows on amphibian and reptile special status species and their habitats within specific project-affected stream reaches. Such Flow-Habitat Evaluation (FHE) studies would be collaboratively designed through consultation with resource agencies. These FHE studies would also utilize methodologies that have been employed by the Licensee in previous relicensing projects in the Feather River watershed such as in the Rock Creek-Cresta (FERC-1962) and the Poe (FERC-2107) projects (Pacific Gas and Electric Company 2001, Pacific Gas and Electric Company and EA Engineering 2001, Pacific Gas and Electric Company 2002, GANDA 2002a, GANDA 2003a, GANDA 2003b, GANDA 2004a, GANDA 2004b, GANDA 2004c, GANDA 2004d).

LEVEL OF EFFORT AND COST

Sufficient data will be collected concerning the presence and distribution of amphibian and aquatic reptile RT&E species in Project-affected reservoirs and stream reaches to allow for an assessment of potential influences of Project operations on these species. The preliminary estimated cost of field studies and reporting under this study plan is approximately $335,000 (2004 dollars). The preliminary estimate reflects the relative difficulty of accessing remote Project-affected waters.

EXISTING INFORMATION

The list of amphibian and aquatic reptile RT&E species with potential to occur in the Project Vicinity was derived using USFS lists. A review of the California Natural Diversity Database (CNDDB 2004), the Museum of Vertebrate Zoology collection records (MVZ 2004), and the California Academy of Sciences collection records (CAS 2003) found few occurrence records for these species in the Project area.

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Study Plan 6.3.4-2

BALD EAGLE AND PEREGRINE FALCON HABITAT AND PRESENCE IN THE PROJECT AREA

DRAFT - December 31, 2004

GOALS AND OBJECTIVES OF STUDY

This study will determine the occurrence of bald eagle (*Haliaeetus leucocephalus*), osprey (*Pandion haliaetus*), and peregrine falcon (*Falco peregrinus*) activity and evaluate suitable nesting and wintering habitat within the DeSabla-Centerville Hydroelectric Project, FERC No. 803 (Project) Area (Project Area5). This study will provide participants in the relicensing proceeding (Licensing Participants6) with information to assess potential Project-related impacts on these species. These surveys rely primarily on helicopter reconnaissance, and therefore will be carried out during coordinated flights covering all suitable habitat areas throughout the Project Area.

NEXUS BETWEEN PROJECT AND RESOURCE TO BE STUDIED AND HOW THE RESULTS WILL BE USED

Reservoir operation in the western United States has generally benefited bald eagles and osprey by creating additional foraging and nesting opportunities. This is certainly true in the Project region where, to the north at Lake Almanor (FERC 2105), a large breeding population of osprey and bald eagle occurs. Less is known of the potential use of the Project by eagles and osprey, however, suitable habitat is present. Even less is known of the location and distribution of suitable peregrine falcon nesting habitat within the Project Area, although the species is known to breed in the nearby upper North Fork Feather River watershed. Operation and maintenance of existing facilities on Butte Creek, West Branch Feather River, Philbrook Reservoir, and Round Valley Reservoir may alter potential wintering and breeding habitat.

If breeding activity by any of these species is detected, an assessment will be made of potential Project effects and as appropriate, a conservation and management plan may be prepared. The survey results will help assess whether the Project has had or is having an affect (positive or negative) on these protected raptors. ***[The Service would also like wintering eagles in this paragraph: "If wintering bald eagles are detected, an assessment will be made of potential Project effects, and as necessary, appropriate protection, mitigation, and enhancement measures will be identified".]***

STUDY AREA

Suitable wintering and nesting habitat ~~within~~ ***[up to one mile from]*** the Project Area for bald eagles

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5 Project Area as defined in Pacific Gas and Electric Company's (PG&E's or Licensee's) DeSabla-Centerville Hydroelectric Project, FERC Project No. 803, Pre-Application Document (PAD), Volume 1 – Public Information, dated October 4, 2004.

6 FERC, Federal and state resource agencies, local governments, Indian tribes, members of the public, and others likely to be interested in the licensing proceeding.

(i.e., mature forest stands located near water bodies with available fish populations for feeding), steep cliffs and rock faces for the peregrine falcon, and Project reservoirs for osprey. ***[The Service is concerned that for nesting bald eagles and peregrine falcon, limiting the study to the Project Area, which is considered to be from 0 to 100 feet out from the Project boundary (as defined in the PAD) is not adequate. Bald eagles are known to nest at least one mile from water, and peregrine falcon will nests on steep cliffs and rock faces that may not be on the stream reaches. Without site-specific information regarding the suitable habitat, the Service requests that PG&E survey one mile from the Project Area in suitable habitat. At the January 6, 2005, PG&E sponsored Study Plan Workshops, the Service indicated that we would like to hear a proposal on survey distances from PG&E biologist Dr. Mark Jenkins.]***

STUDY SITES

Bald eagle wintering and nesting survey study sites in the Project Area will include Round Valley Reservoir, Philbrook Reservoir, and the river reaches of the West Branch Feather River from the two Project reservoirs to the Hendricks Head Dam and from the Butte Creek Diversion Dam to the Centerville Powerhouse. Study sites for nesting osprey activity will include forested habitat adjacent to Round Valley and Philbrook reservoirs. Steep walled canyons of Philbrook Creek, Butte Creek, and the West Branch Feather River will serve as study sites for assessing peregrine falcon nesting habitat.

SCHEDULE

A preliminary habitat assessment for the three target species will be conducted during the winter of 2005. Bald eagle and osprey nesting surveys will be conducted from March through July 2006. Wintering bald eagle surveys will be conducted from December through February 2006-2007. The peregrine falcon nesting habitat assessment will coincide with the wintering bald eagle survey effort. A final report will be prepared by August 2007.

METHODS

Habitat assessment – The preliminary habitat assessment will be conducted with the use of the aerial photography acquired from Study Plan 6.3.5-2. ***[The habitat assessment as proposed by PG&E will provide detailed vegetation mapping within a minimum of 200 feet of the Project Boundary and Project-affected stream reaches. The Service wishes to reinterate that for bald eagle nesting, without site-specific knowledge, habitat should be assessed up to one mile from the Project Area.]*** Suitable nesting and wintering habitat will be mapped, quantified, and used to identify specific study sites.

Nesting habitat – Aerial photography and topographic maps in conjunction with field visits will be conducted to determine nesting habitat suitability. If no suitable nesting habitat is identified, then only winter surveys will be conducted. If nesting habitat is identified, a series of three separate surveys will be conducted, one during March and the two remaining surveys in April through July. Depending on accessibility, a variety of survey modes will be utilized that include boat, vehicle,

helicopter, and walking (Jackman and Jenkins 2004). If bald eagle nests are identified, the protocol described by CDFG (1999) will be followed.

Wintering habitat – Three single day surveys will be conducted monthly between December and February of 2006-2007. Surveys will be conducted a minimum of 2 weeks apart. The survey mode of transportation will mimic that of the nesting habitat survey (Jackman and Jenkins 2004).

In conjunction with bald eagle nesting surveys, osprey nesting activity will be assessed. Four separate, single day surveys will be conducted between April and July 2006. Nest sites will be recorded and the number of fledglings will be counted. During bald eagle wintering surveys, peregrine falcon nesting habitat will be mapped and assessed. Potential habitat will be surveyed via helicopter.

ANALYSIS

The data and results of the surveys will be presented in a written report that will include maps and summary tables. All suitable nesting and wintering habitat will be mapped using the Project geographic information system (GIS) and acreage calculated. Bald eagle, osprey, and peregrine falcon observations will be plotted using a global positioning system (GPS) receiver capable of at least 5-meter accuracy. Bald eagles observed will be classified under one of three age categories: juveniles, 2nd year, and adults.

CONSISTENCY WITH GENERAL ACCEPTED SCIENTIFIC PRACTICE

The methodology described by Jackman and Jenkins (2004) and CDFG (1999) are consistent with the generally accepted scientific techniques used to determine the presence or absence of bald eagle wintering and/or nesting activity. These methods have been endorsed by the California Department of Fish and Game (CDFG) and the U.S. Fish and Wildlife Service (FWS).

PRODUCTS

Study plan reporting requirements (initial and updated study reports and meetings) will be conducted within the timeframes set forth in 18 CFR Part 5. Periodic progress reports will be provided to Licensing Participants annually. At the conclusion of the study, a final report will be produced and inserted into the Licensee's Application for new License, Exhibit E.

The final report will include a description and calculation of suitable nesting and wintering habitat within the Project Area. The report will also include a detailed description of any bald eagles, ospreys or peregrine falcons observed during the time of the survey. A detailed map of the areas surveyed showing suitable habitat areas and the location of individual observations will be included. If bald eagles, osprey or peregrine falcons are identified, a second document will be developed in consultation with the resources agencies that describes conservation and management techniques to protect the populations.

RELATIONSHIP TO OTHER STUDIES

Aerial photography flown as part of Study Plan 6.3.5-2 (Classify and Map Vegetation Community Types in the Project Area) will be used to conduct a preliminary wintering and nesting habitat assessment of the Project Area. Habitat for other sensitive raptor species (Study Plan 6.3.4-3) will also be assessed in this way. During the course of all proposed field studies, crews will be instructed to document and report all sensitive raptor observations.

LEVEL OF EFFORT AND COST

The methods described above were selected because they have been proven adequate to determine the degree of activity in an area and are endorsed by both the CDFG and FWS. Multiple surveys conducted both during the breeding and wintering period will ensure that bald eagle and osprey activity is properly assessed within the Project Area. If nesting activity is identified, three separate surveys conducted between March and June will determine nesting territory occupancy, incubation or tending nestlings, and the number of nestlings near fledging age. Because of the specific use by peregrine falcons of rock ledges on cliff faces for nesting, nesting surveys can be effectively conducted from the air targeting these landscape features.

The estimated cost of field studies and reporting under this study plan is approximately $40,000 (2004 dollars).

EXISTING INFORMATION

Bald eagles are known to occasionally visit the Philbrook Reservoir area in the fall and winter (PG&E 1982), but no breeding activity is known to occur in the immediate Project Area. Bald eagle activity has been recorded northeast of Little Butte Creek (CDFG 2004), north of the Miocene Diversion (Non-Project feature). The Lassen National Forest Land and Resource Management Plan (USFS 1992) referenced fourteen breeding pairs forest wide and estimated 6,900 acres of suitable habitat associated with bald eagle nesting territories.

Osprey are known to use the Philbrook Reservoir area and peregrine falcon activity has been documented in the canyon section of Butte Creek.

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Study Plan 6.3.4-6

SURVEY RT&E FOREST CARNIVORES WITHIN ONE MILE OF THE PROJECT BOUNDARY

December 31, 2004

GOALS AND OBJECTIVES OF STUDY

This study will identify the presence of RT&E7 forest carnivores in suitable habitat within one mile of the DeSabla-Centerville Hydroelectric Project, FERC No. 803, (Project) Boundary (Project Boundary8). The RT&E forest carnivore survey will focus on the detection of wolverine (*Gulo gulo*), Pacific fisher (*Martes pennanti*), pine marten (*Martes americana*), and Sierra Nevada red fox (*Vulpes vulpes necator*) and provide participants in the relicensing proceeding (Licensing Participants9) with information to assess the level of disturbance to forest carnivores that routine Project operation and maintenance activities may represent to these species.

NEXUS BETWEEN PROJECT AND RESOURCE TO BE STUDIED AND HOW THE RESULTS WILL BE USED

Lands within and adjacent to the Project Boundary may provide suitable habitat for forest carnivores. The extent to which RT&E forest carnivores may occupy habitat within and adjacent to the Project Boundary, and whether or not the continued operation and maintenance of the Project has the potential to impact these species is not presently known. Results of this survey effort will not be used to establish a case for absence of RT&E forest carnivores in the Project Boundary as these animals are typically wide ranging and may go undetected. The study will provide some information on the composition, relative abundance and distribution of RT&E forest carnivores in general and will further serve to document areas of potentially suitable habitat within one mile of the Project Boundary.

If RT&E forest carnivore species are detected, an assessment of the potential effects of continued Project operation and maintenance activities will be made, and as necessary, appropriate protection, mitigation, and enhancement measures (PM&Es) will be identified.

STUDY AREA

Suitable habitat (mature forest stands) within one mile of the Project Boundary, including U. S. Forest Service (USFS), Bureau of Land Management (BLM), state managed lands, and PG&E fee title property.

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7 RT&E species as defined in Pacific Gas and Electric Company's (PG&E's or Licensee's) DeSabla-Centerville Hydroelectric Project, FERC Project No. 803, Pre-Application Document (PAD), Volume 1 – Public Information, dated October 4, 2004.

8 Project Boundary as defined in PG&E's PAD, Volume 1, dated October 4, 2004.

9 FERC, Federal and state resource agencies, local governments, Indian tribes, members of the public, and others likely to be interested in the licensing proceeding.

STUDY SITES

Habitat with characteristics suited to the target species will be surveyed. An initial determination as to the exact survey locations will be made with newly acquired aerial photography performed as part of Study Pan 6.3.5-2, Classify and Map Vegetation Community Types in the Project Area. ***[The habitat assessment as proposed by PG&E will provide detailed vegetation mapping within a minimum of 200 feet of the Project Boundary and Project-affected stream reaches. The Service is concerned that this will not completely characterize habitat up to one mile from the Project Boundary.]***.

SCHEDULE

Remote Photo monitoring stations will be selected during summer and fall of 2005. Photo station monitoring will be conducted January through early March 2006. A final report, including map production, will be completed by December 2006.

METHODS

Methods similar to those described by Zielinski and Kucera (1995) for forest carnivore assessments will be used. ***[The Service would like to see the methodology of PG&E's proposed altered forest carnivore protocol of Zielinski and Kucera (1995). In addition, the Service requests that PG&E contact these authors and discuss the methodology proposed. The Service requests documentation of the comments provided by the authors.]*** Remote single sensor camera systems (Trailmaster TM 1550) with an infrared transmitter/receiver, and 35mm camera (Canon Sureshot A1, Yashica AW, or Olympus Infinity) will be used. Monitoring stations will be baited with an animal attractant consisting of dead salmon obtained from the state-operated Oroville fish hatchery; approximately 8 to 10 pounds per station. Firmly securing the bait to a tree will reduce the opportunity for a food reward. Liquid fish emulsion will be spread over the bait sacks weekly and bait will be augmented as needed.

The area within one mile of the Project Boundary will be divided into a minimum of nine $4mi^2$ blocks, with 2 camera stations per block spaced a minimum of one-mile apart. Establishment of remote camera locations will generally follow guidelines described by Zielinski and Kucera (1995) but will focus on areas of suitable habitat in close proximity to Project facilities (i.e., transmission line, Project access roads, power houses, storage reservoirs, and canals).

Depending on access, a variety of travel modes will be utilized including helicopter, snowmobile, and snowshoes. Photo stations will be operational for a minimum of 28 days. It may be necessary to extend the 28 day survey period in order to obtain the required 28 days of photo station operation. Equipment failure, restricted access, and complete exposure of film may render a station inoperable for short periods of time between servicing, requiring additional survey days.

Habitat characteristics associated with each monitoring station will be recorded. A circular plot with a radius of 100 feet centered on each station will be sampled. Vegetation composition and structure,

presence of down-woody-debris, snags, and other suitable denning/resting substrate will be recorded (USFS 1979). Proximity to water and roads will also be identified.

ANALYSIS

Event data and color photos collected from each photo station will be used to identify animal activity. Other physical evidence (tracks, hair, scat) will be sought and documented weekly during photo station maintenance activities.

CONSISTENCY WITH GENERALLY ACCEPTED SCIENTIFIC PRACTICE

The methods described above are consistent with the generally accepted scientific techniques presently used to detect forest carnivores.

PRODUCTS

Study plan reporting requirements (initial and updated study reports and meetings) will be conducted within the timeframes set forth in 18 CFR Part 5. Periodic progress reports will be provided to Licensing Participants annually. At the conclusion of the study, a stand-alone report will be produced. The report will be comprised of six major sections that include: purpose of study, study area, methods, results, discussion, and literature cited. The report will describe survey findings through text, summary tables, and maps. The report will identify and describe the location and characteristics of each photo station and the record of activity documented. If a target species is identified, an assessment of the likely effect of continued Project operation and maintenance activities will be included in the report, along with recommended PM&Es. The report will be included as part of Licensee's Application for New License, Exhibit E.

LEVEL OF EFFORT AND COST

The methods described above were selected because they have proven adequate for forest carnivore detection. The remote camera system offers a unique and an effective way to survey large tracks of land continuously for a specified time period. The proposed length of the survey (28 days) allows for enough time to detect forest carnivores. Foresman and Pearson (1998) reported the mean latency to first detection for fisher, marten, and wolverine (n=1) was 13.5, 9, and 13 days, respectively.

Costs associated with mid-winter field sampling in areas like Philbrook Reservoir and Round Valley Reservoir, because of the difficult access and special equipment needs, are significant. This study will cover a large geographic area and weekly sampling will likely require three days to complete by a team of biologists. The Licensee's preliminary estimated cost to perform this study is approximately $100,000 (2004 dollars).

EXISTING INFORMATION

In 1990, the Lassen National Forest (LNF) identified 5 fisher Habitat Management Areas (HMA's) forest-wide. The HMA's from a network of suitable habitat that are interconnected with 600 foot

wide travel corridors primarily located along riparian areas (USFS 1992). Nineteen martin HMA's were also delineated in 1990 by the LNF. Similar to fisher HMA's, the marten HMA's are interconnected by travel corridors (USFS 1992).

The LNF reported three separate sighting of marten within the vicinity of Philbrook Reservoir (USFS file data). No other occurrences have been reported within the watersheds associated with the Project.

REFERENCES

Foresman, K. R., and D. E. Pearson. 1998. Comparison of proposed survey procedures for detection of forest carnivores. Journal of Wildlife Management 62:1217-1226.

USFS. 1979. Wildlife habitats in managed forests in the Blue Mountains of Oregon and Washington. U.S. Department of Agriculture, Forest Service. Agriculture Handbook No. 553.

_____. 1992. Land and resource management plan, Lassen National Forest. U.S. Department of Agriculture, Forest Service. Pacific Southwest Region.

Zielinski, W. J. and T. E. Kucera, editors. 1995. American marten, fisher, lynx, and wolverine: survey methods for their detection. U.S. Department of Agriculture, Forest Service, General Technical Report PSW-GTR-157.

Study Plan 6.3.5-2
CLASSIFY AND MAP VEGETATION COMMUNITIES IN THE PROJECT AREA
DRAFT – January 3, 2005

GOALS AND OBJECTIVES OF STUDY

This study will provide a detailed vegetation map showing the location of all plant communities occurring within a minimum of 200 feet from the DeSabla-Centerville Hydroelectric Project, FERC No. 803 (Project) Boundary10 and Project-affected stream reaches, including wetland, riparian, and littoral community types. Project-affected stream reaches include Butte Creek from Butte Creek Diversion Dam down to, but not including, the non-Project Parrott-Phelan Diversion Dam and the West Branch Feather River from Round Valley Reservoir down to, but not including, the non-Project Miocene Diversion.

The study will provide participants in the relicensing proceeding (Licensing Participants11) with a better understanding of the vegetation communities present in the study area, the extent of each vegetation community type, and will provide useful information for the planning of other resource studies to be conducted in support of the Project relicensing effort.

NEXUS BETWEEN PROJECT AND RESOURCE TO BE STUDIED AND HOW THE RESULTS WILL BE USED

Vegetation maps will allow acreage calculations for wetlands, riparian areas and littoral habitats. Vegetation maps will be used during the initial stages of planning certain other biological study plans. Vegetation mapping will aid in the identification of suitable habitat for RT&E species.

High-resolution orthorectified aerial photography is necessary to develop an accurate map at a suitable scale to allow delineation of vegetation community types, especially small-scattered wetlands, riparian zones, and littoral habitats. In addition, aerial photography will aid field crews in planning and conducting the required surveys for wildlife and plant RT&E species, and noxious weeds.

STUDY AREA

See *Study Sites* section.

STUDY SITES

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10 Project Boundary as defined in Pacific Gas & Electric Company's (PG&E's or Licensee's) DeSabla-Centerville Hydroelectric Project, FERC Project No. 803, Pre-Application Document (PAD), Volume 1 – Public Information, dated October 4, 2004.

11 FERC, Federal and state resource agencies, local governments, Indian tribes, members of the public, and others likely to be interested in the licensing proceeding

Area of coverage will include all Project features, with an additional buffer area of not less than 200 feet above the normal seasonal high water elevation around Project reservoirs, Butte Creek, and the WBFR. The mapping boundary on the WBFR will include a 200-foot buffer around both Philbrook and Round Valley reservoirs and extend downstream to the Miocene Diversion. The mapping boundary on Butte Creek will consist of a 200-foot buffer upstream of Butte Creek Diversion Dam and extent downstream to the Parrot-Phelan Diversion. Vegetation will also be mapped along the Toadtown and Hendricks canals. Other tributary streams associated with the shoreline of Project reservoirs, Butte Creek, and WBFR will be included in the mapping. Tributary streams will be mapped a minimum of 200 feet upstream of the reservoir's seasonal high water mark, or their confluence with Butte Creek and WBFR.

SCHEDULE

To the extent feasible, aerial coverage will be flown to accommodate multiple relicensing study goals sometime within the window of April 1st to September 30th, 2005. Post-processing of the film will require a minimum of 4 to 6 weeks and could require as much as 12 weeks. Aerial photo field checking will take place as soon as possible after the film becomes available. Report preparation, including map production, is targeted by year's end, 2005.

METHODS

All riparian and wetland communities will be mapped at a scale of 1 inch = 600 feet. All photographs will be field checked to ensure correct interpretation of vegetation types. A fixed wing aircraft will fly the entire Project Area and document plant communities using the following criteria:

- Low-level aerial photographic coverage (natural color) in stereo at 1:7,200 scale
- Airborne GPS to provide x, y, z control points for each photo center
- Ground control survey to supplement airborne global positioning system (GPS)
- Aerotriangulation of photography
- Scan all negatives at 600 dpi
- Use U. S. Geological Survey 30m digital elevation models for orthophoto productions
- Perform orthorectification of photography using appropriate software
- Mosaic and clip orthophotos into workable file sizes
- Base grid on UTM Zone 10, NAD 1983
- Provide imagery on CD-ROMs in TIF format with TFW header files (1 inch = 600 feet, 1 pixel = 1 sq. ft.)

ANALYSIS

Photo imagery will be analyzed by a qualified botanist to identify all vegetation cover types based on the Sawyer and Keeler-Wolf (1995) habitat classification system. Each cover type designation will be ground truthed ***[The Service requests that you explain the methodology that will be used for "ground-truthing"]*** by a qualified botanist and afterward total acres will be determined for each type within the study area.

CONSISTENCY WITH GENERALLY ACCEPTED SCIENTIFIC PRACTICE

The methods described here are consistent with best available techniques for landscape level resource mapping and will in addition yield georeferenced imagery to support the Project's mobile geographic information system (GIS) platform. This technique has been applied successfully on several recent hydro relicensing projects in this region of California including the Rock Creek-Cresta Project (FERC 1962), and the Upper North Fork Feather River Project (FERC 2105).

PRODUCTS

Study plan reporting requirements (initial and updated study reports and meetings) will be conducted within the timeframes set forth in 18 CFR Part 5. Periodic progress reports will be provided to Licensing Participants annually. A final report prepared under Study Plan 6.3.5-1 (Map RT&E Species in the Project Area) will contain the written vegetation community descriptions that derive from the vegetation mapping study, along with tabular data on the extent of each community type in the Project Area. Detailed electronic maps will also be prepared utilizing the aerial imagery as a background and delineating community types as appropriately labeled polygon features. The electronic maps will be in CD format. Several CDs may be necessary to provide full coverage of the entire study area.

RELATIONSHIP TO OTHER STUDIES

Aerial imagery of the Project Area is key to the planning and design of several other studies including, the RT&E survey for forest carnivores (Study Plan 6.3.4-6), assessment of RT&E raptor habitat and presence (Study Plan 6.3.4-3), assessment of willow flycatcher habitat and presence (Study Plan 6.3.4-4), mapping of RT&E plant species (Study Plan 6.3.5-1) and assessment of noxious weeds (Study Plan 6.3.5-3). ***[The Service is concerned this vegetation mapping study plan may not provide detailed vegetation mapping for the aforementioned studies that may have project-related effects well outside the minimum 200 feet as proposed.]*** When available, this imagery will be incorporated into the Project mobile GIS platform where it will serve as one of the background layers that aids on-the-ground navigation by field crews.

LEVEL OF EFFORT AND COST

The estimated cost of this work is approximately $80,000 (2004 dollars). This estimate assumes that aerial photography occurs early in 2005 when ground conditions and other logistics allow. The higher elevation areas (Round Valley and Philbrook reservoirs) will need to be free of snow prior to the flight so that vegetation community types can be accurately differentiated. Post-processing of the imagery and satellite data will require several weeks. Ground verification of vegetation types will be completed by summer 2005.

EXISTING INFORMATION

PG&E attempted to locate existing sources of recent high resolution color imagery covering the Project Area, but none could be found of the resolution (one pixel = one-square foot) necessary for detailed mapping of small habitat patches such as wetlands, riparian zones and littoral habitats.

REFERENCES

Sawyer, J. O. and T. Keeler-Wolfe. 1995. A manual of California vegetation. California Native Plant Society, Sacramento.

Study Plan 6.3.3-5

SURVEY BENTHIC MACROINVERTEBRATES IN PROJECT-AFFECTED STREAM REACHES USING CSBP PROTOCOLS

Draft - December 28, 2004

GOALS AND OBJECTIVES OF STUDY

This study will characterize benthic macroinvertebrate (BMI) assemblages and habitat within the Pacific Gas and Electric Company's (PG&E's or Licensee's) DeSabla-Centerville Hydroelectric Project, FERC No. 803 (Project) Area (Project Area[1]) during the fall of 2005 using the California Stream Bioassessment Procedure (CSBP). The BMI characterization will provide baseline data for Project-affected[2] stream reaches and assess stream conditions relative to sediment contributions from Project spillways at Round Valley and Philbrook dams. The BMI characterization will also describe differences in BMI assemblages at study sites upstream and/or downstream from Project facilities to assess the potential influences of Project operations on the BMI community and assess the adequacy of existing protection, mitigation, and enhancement measures (PM&Es). The study results obtained from Project-affected stream reaches will be compared to a reference site whenever site conditions permit a valid comparison. ***This study should also include development of macroinvertebrate flow-habitat relationships using criteria developed by Professor James Gore (now at the University of South Florida St. Petersburg). This information will be critical to develop instream flow recommendations for tributaries with intermittent flows (US Fish and Wildlife Service 2004).***

NEXUS BETWEEN PROJECT AND RESOURCE TO BE STUDIED AND HOW THE RESULTS WILL BE USED

Streamflow alteration resulting from Project diversions and reservoirs has the potential to affect environmental conditions within all aquatic habitats, including the associated riparian habitats. Project operations therefore have the potential to affect the distribution, abundance, and structure of the benthic communities within Project-affected streams. Erosion at spillways for Round Valley and Philbrook dams has been identified as a preliminary issue that may arise from Project operations[3]. Evaluating the composition of the BMI community will supplement information already collected for Butte Creek and may be useful in assessing the potential effect of Project operations on the aquatic environment.

STUDY AREA

The BMI assemblages will be sampled in all Project-affected reaches of the West Branch Feather River (WBFR) and tributaries, in Project-affected tributaries to Butte Creek, and in Butte Creek between Lower Centerville Diversion Dam (LCDD) and Centerville Powerhouse (CPH). In

[1] Project Area as defined in Pacific Gas &Electric Company's DeSabla-Centerville Hydroelectric Project, FERC Project No. 803, Pre-Application Document (PAD) Volume 1 – Public Information, dated October 4, 2004.
[2] Project-affected as defined in PAD, Volume 1, dated October 4, 2004.
[3] Reference PAD, Volume 1, dated October 4, 2004.

addition, one reference site will be sampled immediately upstream of the points of diversion, where appropriate. Because multiple years of BMI data is already available on Butte Creek for sites upstream of DeSabla Powerhouse and downstream of CPH, no additional BMI sampling is proposed in those areas.

STUDY SITES

BMI study sites are identified in Table 1. Generally, one reference site will be sampled upstream of each diversion and one site downstream of the diversion. In the case of the WBFR from Hendricks Head Dam to Miocene Diversion Dam (approximately 14.2 river miles), an intermediate site may be sampled to assess the BMI assemblage on U. S. Forest Service (USFS) land in the middle of the reach, depending on access. Two BMI sites are proposed in Butte Creek between LCDD and CPH to characterize this stream section, in addition to sampling feeder tributaries to the Butte Canal.

In this study, eight sites are proposed within the Project's Butte Creek drainage basin[4] and 16 sites are proposed within the Project's WBFR drainage basin[5]. Each site will be 100 m (300 ft) in length; duplicate samples will be collected in 10% of the reaches for Quality Assurance/Quality Control (QA/QC) purposes (CDFG 2003). The reaches selected for duplication will be randomly selected prior to the field sampling effort.

[4] Project's Butte Creek drainage basin as defined in PG&E's PAD, Volume 1, dated October 4, 2004.
[5] Project's West Branch Feather River drainage basin as defined in PG&E's PAD, Volume 1, dated October 4, 2004.

Table 1. Proposed BMI Sampling Sites/ Reaches and Project-affected Streams and Rivers.

Project's Butte Creek drainage basin		Number of Sites/ Reach
Butte Creek: between LCDD and CPH		2
Inskip Creek: upstream of diversion (reference)		1
downstream of diversion		1
Kelsey Creek: upstream of diversion (reference)		1
downstream of diversion		1
Clear Creek: upstream of diversion (reference)		1
downstream of diversion		1
	TOTAL	**8**
Project's West Branch Feather drainage basin		
Coon Hollow (if suitable as reference for WBFR upstream of Hendricks Head Dam)		1
West Branch Feather River:	Between Round Valley Dam and Round Valley Spillway	1
	Downstream of Round Valley Spillway	1
	Upstream of Hendricks Head Dam	1
West Branch Feather River:	Miocene Diversion Dam to Hendricks Head Dam	3
Philbrook Creek: upstream of Philbrook Reservoir		1
between of Philbrook Dam and spillway		1
downstream of Philbrook Spillway		1
Long Ravine: upstream of diversion (reference)		1
downstream of diversion		1
Cunningham Ravine: upstream of diversion (reference)		1
downstream of diversion		1
Little West Fork: upstream of diversion (reference)		1
downstream of diversion		1
	TOTAL	**16**

SCHEDULE

The field sampling for the BMI study will be conducted between August 1 and October 31, 2005. Data analysis and report production will take place at the conclusion of the field sampling. Laboratory identification will occur during the winter and spring, beginning late November 2005. CSBP laboratory identification QC procedures will begin when all the samples are thoroughly identified and returned to the Licensee.

METHODS

Sampling protocol will generally follow the guidelines from the California Stream Bioassessment Procedure (CSBP) (CDFG 2003). Sampling will be conducted in habitats where the access and depth (≤1.5 m) do not require the use of a boat. In general, the procedure will follow the CSBP guidelines for sampling high gradient channels (identified in the CSBP as stream channels with a slope greater than 1%). To illustrate this procedure, the CSBP high gradient channel guidelines are adapted here:

CSBP for High Gradient Channels
High gradient channels have a slope greater than a 1% and will contain pool-riffle sequences high enough to contain at least 3 riffles per 100 m (300 ft) reach. Riffle substrate may be rock, sand or mud, but must be at least 1 m (3 ft) wide with flow velocities greater than 0.3 m/sec (1 ft/sec).
Step 1. Identify and measure a 100 m (approximately 300 ft) reach of stream channel and count the number of riffles greater than 1 m (approximately 3 ft) in width and length. Randomly select 3 riffles. This will represent the site.
Step 2. Starting at the downstream riffle lay the measuring tape along the bank of the entire riffle, being careful not to walk in the stream. Randomly select three transects from all possible 0.3 m (1 ft) increments. For riffles longer than 10 m (30 ft), use the top third of the riffle.
Step 3. Select 3 sample locations along the transect. If the substrate is generally uniform along the transect, locate the 3 locations along the stream margins and at the center of the stream. If the substrate is structurally complex along the transect, let the 3 sample locations reflect the complexity.
Step 4. At each of the three sample locations, place the D-shaped net on the substrate and disturb a 1 ft by 1 ft area upstream of the net mouth, excavating the substrate to an approximate depth of 10-15 cm (4-6 in). Maintain a consistent sampling effort (1.5 minutes) at each area. Combine the 3 collections within the net to make one "composite" sample.
Step 5. Empty the contents of the net in a standard No. 35 size sieve (0.5 mm mesh) or white enameled tray. Remove the large debris by hand after carefully inspecting for clinging organisms. If the pan is used, run the material through the sieve to remove excess water. Place the remaining sampled material in the jar and completely fill with 95% ethanol. Do not fill a jar more than 2/3 full with coarse sampled material or 1/2 full with sand or mud. **Gently** agitate jars to mix the alcohol and contents, being careful not to damage collected organisms.
Step 6. Place a site label in each jar and tape a secondary site label to the exterior.
Step 7. Proceeding upstream, repeat Steps 2 through 5 for the next two randomly selected riffles within the stream reach. The three samples collected for the stream reach will represent the site.
Step 8. **QA/QC: For projects with 20 or more sites, duplicate samples must be collected at 10% of the reaches.** For reaches containing more than six riffles, randomly choose 3 riffles for the primary set of samples and randomly choose 3 different riffles for the

duplicate set of samples. For reaches that contain 6 or less riffles, measure the entire length of all riffle habitat and randomly select 3 transects from the total length (using 0.3 m [1 ft] increments as transect markers) for each the primary and duplicate samples.

To ensure that all channel conditions are appropriately sampled, the CSBP identifies a number of unusual environments and suitable protocol. The following CSBP excerpt identifies "unusual" environments that may be encountered in the Project Area.

CSBP for Intermittent or Ephemeral Channels: Intermittent or ephemeral channels will have flowing water during the rainy season and be dry during mid to late summer. These channels can be sampled using the CSBP for high or low gradient streams, but must be sampled in a spring (March through May) index period or at the end of the wet period.
CSBP for No Flow Conditions in High and Low Gradient Channels: Although this is very problematic for sampling BMIs, sometimes sampling areas in high gradient streams have pocket water with little or no flow. In this case, put the net at the downstream portion of the sampling area, disturb the substrate and push the water into the net with vigorous hand motions. Strained water from the surface of a nearby pool with a bucket can be used to move organisms into the net by pouring the water into the pocket area in front of the net. In low gradient channels, low flow or no flow conditions can be quite common. In this case, put the net downstream of the sampling area, get in front of the net and agitate the substrate with a twisting foot motion for 30 seconds. At 5-10 second intervals throughout the agitation, step aside and swiftly move the net in a "figure eight" motion through the cloud of suspended substrate.
CSBP for Channels <1 M (3 ft) Wide (the "Spot-Sampling" modification): High gradient channels <1 m (<3 ft) wide can not be sampled using the 1/3 m (1 ft) wide D-frame net at three places along the transect. In this case, divide the channel into an upper, middle and lower section, relative to the flow. Each section should be approximately 30 m long, but could be divided by natural breaks in the morphology of the channel. Survey each section, without stepping into the channel for all 0.09 m2 (1 ft2) areas where the substrate and flow resemble a riffle. Randomly select 3 of these "sampleable areas" in the lower section and composite them into one sample. Proceed upstream and repeat for each section.
CSBP for Large Boulder Channels: High gradient channels that are dominated by boulder substrates too large to move, but with enough gravel substrate in patches between the boulder can be sampled similarly to the previous modification. After dividing the channel into three sections, count the patches of substrate small enough to sample and randomly select three patches. Composite the three samples and proceed upstream to sample the next two sections.
CSBP for Channels Immediately Below Water Impoundments: High gradient channels immediately below a water impoundment structure that prevents gravels and fines from moving downstream will often not contain shallow-fast water habitats with gravel or cobble substrates. These channels can be sampled either using the modification for large boulder channels or by using the low gradient procedure where 3 transects are chosen randomly from the entire reach.
CSBP for Channels with Three or Fewer Riffles: High gradient channels that are wider than 1 m (3 ft), but have 3 or fewer riffles within the 100 m (300 ft) reach will not allow for an independent sample from several riffles. In these cases, measure the entire length of all riffle habitat and select the 3 transects randomly from the total length.
CSBP for Channels with Continuous Riffle Habitat: Stream reaches (usually very high gradient) that have continuous riffle habitat should be sampled using the low gradient procedure where 3 transects are chosen randomly from the entire reach.

CSBP Field Procedures for Measuring Chemical and Physical/ Habitat Quality

The physical/habitat scoring criteria is a measure the physical integrity of a stream and will be conducted at each study site. Prior to implementation, field crews will calibrate their visual measurements on a test stream.

The following list of quantitative measures of chemical and physical/habitat characteristics will also be collected at each site:

- GPS coordinates at each site
- Water temperature, specific conductance, pH, alkalinity and dissolved oxygen using approved standardized procedures and instruments
- Substrate composition will be visually estimated using the following categories: fines (<0.25 cm), gravel (0.25-0.8 cm), cobble (0.8-25 cm), boulder (>25 cm) and bedrock
- Average length, width and depth for each of the 3 randomly chosen riffles (for unmodified high gradient protocol only)
- Water velocity immediately upstream of the three composite samples along each of the 3 transects
- Percent cover upstream of the three composite samples along each of the 3 transects. Measure this parameter using a densiometer 0.3 m (1 ft) above the water surface and averaged for each transect
- Substrate consolidation at the three sample excavations along the 3 transects. Estimates are obtained while collecting the BMI sample by noting whether the substrate is loosely, moderately or tightly cemented
- Pebble count and percent embeddedness immediately upstream of the 3 transects where BMI samples were collected. Measure this parameter by establishing a transect approximately 0.3 m (1 ft) upstream of the sample transect, randomly choosing 10 points along the transect, reaching down to the point at the end of a wooden dowel or tip of the boot and measure the width of the particle. For every third particle (3 on each transect), estimate percent embeddedness by noting how much of the particle was surrounded by fine substrate.

ANALYSIS

Laboratory Procedures

Taxonomic identification of BMI samples collected using the CSBP will be performed by a professional or permanent university laboratory with extensive experience with California taxa. The bioassessment laboratory selected for the study will participate in the California Bioassessment Laboratories Network (CAMLnet) to ensure that they are experienced with the standardized level of taxonomy and QA/QC procedures in California.

The laboratory also will:

1. provide a Laboratory Standard Operation Procedure (SOP) document and Quality Assurance Protection Plan (QAPP)

2. provide a list of all taxonomists that will work on the samples including their education, years of experience and any specialized training they have received.
3. provide internal QA/QC documentation for subsampling (the CSBP requires fixed count subsampling with a +/- 10% accuracy) and taxonomic validation;
4. perform taxonomy consistent with the CAMLnet Taxonomic Effort Standards (available at: www.dfg.ca.gov/cabw/camlnetste.pdf).

BMI samples will be identified to CSBP Level 1. This level of identification is used for most state-wide rapid bioassessment projects. In general, the Level 1 taxonomic effort is identifies BMI specimens to genera, where possible, for most taxonomic groups, order for oligochaetes, and family for chironomids.

The CDFG Aquatic Bioassessment Laboratory (ABL) will be contracted to perform an external 10% QC review of the sample identification. Nine of the 87 samples will be randomly selected for the 10% QC by the CDFG ABL.

Data Production, Storage and Analysis

Data will be stored in a Microsoft Access® database developed by the CDFG ABL (or other appropriate database system). This database is loosely based on the U.S. EPA's Environmental Data Analysis System (EDAS). The database will produce Project-specific biological metrics.

Biological metrics will be independently calculated for the three samples collected at each site. Once the independent metrics are calculated, they will be averaged to represent that site. 95% confidence limits will also be calculated for the averages to describe the relationship between sites. The biological metrics will be presented in graphical or tabular form in the completed report. Other appropriate indices may be used to describe the BMI community, such as the Morista-Horn or Jaccard Indices for similarity.

CONSISTENCY WITH GENERALLY ACCEPTED SCIENTIFIC PRACTICE

The CSBP is the standard procedure for rapid bioassessment in California using the BMI community. The CSBP is a regional adaptation of the national Rapid Bioassessment Protocols developed by the U.S. Environmental Protection Agency in "Rapid Bioassessment Protocols for use in Streams and Rivers" (EPA/841-B-99-002). In California, this practice has been extended to include the assessment of hydro projects and their effects on the BMI community in bypass reaches.

PRODUCTS

Study plan reporting requirements (initial and updated study reports and meetings) will be conducted within the timeframes set forth in 18 CFR Part 5. Periodic progress reports will be provided to Licensing Participants annually. At the conclusion of the study, a full report will be produced and inserted into the Licensee's Application for new License, Exhibit E.

RELATIONSHIP TO OTHER STUDIES

Field sampling at specific sites for the BMI Study will be conducted prior to sampling fish sites as part of Study Plan 6.3.3-4 (Characterize Fish Populations in Project Reservoirs and Project-Affected Stream Reaches) to avoid potential impacts to the BMI community.

LEVEL OF EFFORT AND STUDY COST

The preliminary estimated cost of the BMI study and study reporting requirement under this study plan is approximately $87,000 (2004 dollars), including coordination and meetings. The estimate assumes a pair of biologists is able to complete two BMI sites per day over three separate field trips.

EXISTING INFORMATION

CDFG (2004) and the U.S. Geological Survey, USGS, (Domagalski et al 2000) have collected BMI data at various locations in Butte Creek between Butte Meadows and the Sacramento River confluence. The table below describes Butte Creek BMI data collected by USGS and CDFG within the Project's Butte Creek drainage basin.

Site	USGS	CDFG
Honey-Run Road	1997, 1998	1997, 1998, 1999, 2000
Doe-Mill Road	1997	1997, 1998, 1999, 2000, 2002
Rich Bar Road	--	2000, 2002
Cherry Hill Campground	--	1997, 1998, 1999, 2000

REFERENCES

California Department of Fish and Game (CDFG). 2003. California stream bioassessment procedure (Protocol brief for biological and physical/habitat assessment in wadeable streams).

_____. 2004. CDFG benthic macroinvertebrate data (unpublished).

Domagalski, J. L., P .D. Dileanis, D. L. Knifong, C. M. Munday, J. T. May, B. J. Dawson, J. L. Shelton, and C. N. Alpers. 2000. Water-quality assessment of the Sacramento River basin, California: Water-quality, sediment and tissue chemistry, and biological data, 1995-1998. U.S. Geological Survey Open-File Report 00-391. Available at: http://ca.water.usgs.gov/sac_nawqa/waterindex.html.

US Fish and Wildlife Service. 2004. Flow-Habitat Relationships for Macroinvertebrates in Small Streams in the Big Creek Project. Sacramento, CA.

Study Plan 6.3.3-4

CHARACTERIZE FISH POPULATIONS IN PROJECT RESERVOIRS AND PROJECT-AFFECTED STREAM REACHES

DRAFT - December 28, 2004

GOALS AND OBJECTIVES OF STUDY

This study will characterize the abundance, distribution, and structure of the fish communities in Project-affected[1] waters of Pacific Gas and Electric Company's (PG&E's or Licensee's) DeSabla-Centerville Project, FERC No. 803 (Project).

The fish population characterization will supplement existing fish population information and provide participants in the relicensing proceeding (Licensing Participants[2]) with information to assess potential Project impacts on fish populations in Project reservoirs and Project-affected stream reaches, and make informed decisions regarding management of the transition zone (i.e., "sucker-hardhead-pikeminnow assemblage"; Moyle 2002) and cold water (i.e., "rainbow trout assemblage"; Moyle 2002) fish communities. The information will also provide information that may prove useful to the resource agencies in maintaining or enhancing their programs benefiting special status fish species such as spring-run Chinook salmon, steelhead trout, hardhead, and California roach.

NEXUS BETWEEN PROJECT AND RESOURCE TO BE STUDIED AND HOW THE RESULTS WILL BE USED

The presence and operation of Project diversions and reservoirs has the potential to alter environmental conditions in stream habitats and thus may have the potential to change the abundance, distribution, and structure of the local fish communities. In particular, Project-related water diversions may affect fish growth and isolate small populations of organisms. This study is essential in determining the effects of Project operations on the resident fish communities, including condition, growth, and recruitment.

The information obtained from this study will be used in combination with existing information to evaluate the effects of the Project water diversions and impoundments on the local fish communities and assess the adequacy of existing protection, mitigation, and enhancement measures (PM&Es) for these fish communities.

STUDY AREA

Table 1 lists the stream reaches identified for sampling. Table 2 lists the Project impoundments identified for sampling.

[1] Project-affected as defined in PG&E's DeSabla-Centerville Hydroelectric Project, FERC Project No. 803, Pre-Application Document (PAD), Volume 1 – Public Information, dated October 4, 2004.

[2] FERC, Federal and state resource agencies, local governments, Indian tribes, members of the public, and others likely to be interested in the licensing proceeding.

STUDY SITES

Sample sites for each Project–affected stream will include one to two sites located within each Project-affected reach and one reference site upstream of the applicable water diversion, where appropriate. Where possible, fish sampling sites will be located at historic fish sampling sites or sites with similar geomorphic and aquatic habitat characteristics for comparative purposes.

Table 1 identifies 9 proposed electrofishing sites and 7 snorkel sites in the Project's Butte Creek drainage basin[3], and 16 proposed electrofishing sites in the Project's West Branch Feather River drainage basin[4].

Table 1. Proposed Fish Sampling Reaches and Sampling Methods for Project-affected Streams.

Project's Butte Creek drainage basin		Electro-fishing	Direct Observation
Butte Creek: Upstream of BHD (reference for BHD to FOBDD)		X	
BHD toFOBDD (2 sites)		X	
LCDD to CPH (4 sites)			X
CPH to Covered Bridge (3 sites)			X
Inskip Creek: upstream of feeder diversion (reference)		X	
downstream of feeder diversion		X	
Kelsey Creek: upstream of feeder diversion (reference)		X	
downstream of diversion		X	
Clear Creek: upstream of feeder diversion (reference)		X	
downstream of diversion		X	
Project's West Branch Feather River drainage basin			
Coon Hollow Creek (if suitable as reference site to WBFR upstream of Hendricks Head Dam)		X	
West Branch Feather River:	Round Valley Reservoir to Coon Hollow Creek	X	
	Coon Hollow Creek to Philbrook Creek	X	
	Philbrook Creek to Hendricks Head Dam (2 sites)	X	
West Branch Feather River:	Hendricks Head Dam to Miocene Diversion Dam (2 sites)	X	
Philbrook Creek: upstream of reservoir (reference)		X	
downstream of reservoir		X	
Long Ravine: upstream of Hendricks Canal (reference)		X	
downstream of diversion		X	
Cunningham Ravine: upstream of diversion (reference)		X	
downstream of diversion		X	
Little West Fork: upstream of diversion (reference)		X	
downstream of diversion		X	

BHD = Butte Head Dam, LCDD = Lower Centerville Diversion Dam, CPH = Centerville Powerhouse, PPDD = Parrott-Phelan Diversion Dam, FOBDD = Forks of Butte Diversion Dam

[3] Project's Butte Creek drainage basin as defined in PG&E's PAD, Volume 1, dated October 4, 2004.
[4] Project's West Branch Feather River drainage basin as defined in PG&E's PAD, Volume 1, dated October 4, 2004.

If feasible, sampling in Project impoundments (DeSabla Forebay, Philbrook Reservoir and Round Valley Reservoir) will be performed by gillnetting. Alternatively, boat electrofishing may be used to characterize fish populations in DeSabla forebay (Table 2).

Table 2. Proposed Fish Sampling Methods for Project Impoundments.

Reservoir	Sample Method
DeSabla Forebay	Gillnet or Electrofishing
Philbrook Reservoir	Gillnet
Round Valley Reservoir	Gillnet

SCHEDULE

Fish population sampling is scheduled once each year in 2005 and 2006, during the late summer or fall period.

METHODS

Electrofishing generally will be conducted following procedures identified by Reynolds (1996). Electrofishing will be performed during low flow conditions in the late-summer or fall to ensure the safety of the field crew. Electrofishing will not take place in the Butte Creek reaches where listed anadromous salmonids may potentially be present (i.e., LCDD to CPH and CPH to Covered Bridge, Table 1). A multiple pass regression methodology will be employed to estimate fish population abundance (Zippin 1958). In general, three electrofishing passes will be conducted in a section of stream approximately 100 meters in length, where feasible. Electrofishing will be conducted in water sufficiently shallow to adequately and safely permit fish capture (less than 1.5 meters maximum depth). An electrofishing crew will consist of one to two backpack shockers and two to four net/ bucket persons depending on the size of wetted stream channel. ***Block nets should be used at the top and bottom of each section to prevent fish moving into or out of the section during electrofishing - this will enable a more accurate quantification of population densities.***

In stream sections where conditions prohibit effective capture of fish, a mark-recapture method may be employed. In this event, captured fish will be processed (i.e., identified, measured and weighed) and marked (fin-clipped) and released back into the site. The site will then be allowed to rest for two hours before being resampled. Captured fish will be enumerated and categorized as marked or unmarked; unmarked fish will be processed as before. These data will be used to estimate the population.

Direct observation methods (snorkeling) will be used to assess the fish populations in the Butte Creek reaches, LCDD to CPH and CPH to the Covered Bridge (Table 1). Data collected in these reaches will supplement spring-run Chinook surveys, Study 6.3.3-1. Where applicable, snorkeling generally will be conducted following procedures identified by Dolloff et al (1996).

Qualitative snorkel assessments are proposed at 7 riffle/run sites (four between LCDD and CPH, and four between CPH and the Covered Bridge), and all fish species will be recorded.

Gillnetting will take place during the summer or early fall months. Nets will be deployed at a two to three locations (depending on the size of the waterbody) covering nearshore and deepwater habitats at each impoundment. Round Valley Reservoir is drained annually so the area to be sampled will be small. Gillnets will be set for two consecutive day and night periods in Philbrook Reservoir to facilitate good coverage. Because of the better road access to DeSabla Forebay, boat electrofishing may be used as an alternative to gill netting.

Fish capture information will include: species identification, fork length (FL, mm), weight (grams), and if applicable, notes on general condition.

General site information for stream survey locations will include stream name, reach, site length and mean width, crew members, time of day, environmental (weather) conditions, riparian/channel conditions (e.g., % canopy, substrate, depth, etc.), aquatic habitat condition (e.g., habitat type(s), cover, etc.), water chemistry, and GPS location. Photographs will also document the specific location and conditions of the site. For impoundment surveys, general information recorded will include impoundment name, GPS sample site location, crew members, time of day, environmental conditions, and water chemistry.

ANALYSIS

The collected fish data will be stored in an Access database for data reduction, tabulation, and summary. The fish population analysis will be evaluated by species and size/age class, if feasible. Abundance estimates will be calculated in terms of fish per 100 meters of stream; biomass will be estimated in terms of kilograms per 100 meters of stream. Computer software developed by Van Deventer and Platts (1989) around the method of multiple regression analysis will be used to estimate abundances. Size/age structure will be presented as the frequency (number of individuals) or proportion of the captured fish per size/age category. Where available, growth information will be presented for target species, based on appropriate back-calculation (age-at-length) methods. Depending on method, growth information will be presented as either graphical or tabular format. Station habitat conditions will be summarized in the following ways: length of station, mean stream width, mean stream depth, wetted surface area, wetted volume, flow, and estimates of the various physical characteristics

CONSISTENCY WITH GENERALLY ACCEPTED SCIENTIFIC PRACTICE

Snorkeling and electrofishing are widely accepted methods for sampling fish populations in stream habitats. The sampling methods described here are from *Fisheries Techniques 2nd Edition*, a special project publication by the American Fisheries Society. This textbook is a comprehensive reference volume of modern sampling and data collection methods in fisheries science used by students and professionals.

PRODUCTS

Study plan reporting requirements (initial and updated study reports and meetings) will be conducted within the timeframes set forth in 18 CFR Part 5. Periodic progress reports will be provided to Licensing Participants annually. At the conclusion of the study, a full report will be produced and inserted into the Licensee's Application for new License, Exhibit E.

RELATIONSHIP TO OTHER STUDIES

Information collected for Study Plan 6.3.3-1, Survey Spring-run Chinook Salmon Pre-Spawning Mortality and Spawning Escapement, will also provide information on fish populations for the reach downstream of the LCDD and CPH.

LEVEL OF EFFORT AND STUDY COST

The Licensee's preliminary estimated cost of field studies, analysis and report preparation under this study plan is approximately $165,000 (2004 dollars). The preliminary estimate considers the following assumptions:

- Electrofishing of streams in the Project Area[5]: Electrofishing assumes small streams will be sampled using three biologists; one backpack shocker, one netter, and one livecar person; a six-person crew is assumed for larger sites, consisting of two backpack shockers, two net persons and two livecar persons. On small streams, 2 sites will be sampled per day, and on large streams, 1 site per day.

- Gillnetting Project impoundments in the Project Area: Gillnetting assumes sampling will take place when reservoirs are drawn down and are at or near minimum pool. Boat electrofishing may be used in DeSabla Forebay as an alternative to gillnetting.

- Snorkel survey of Lower Butte Creek in the Project Area: Snorkel surveys are based on four survey sites upstream of Centerville Powerhouse and three sites downstream, assuming one day per site for 3 people.

- Reporting: Study plan reporting is based on the requirements set forth in 18 CFR Part 5.

EXISTING INFORMATION

The following existing information is identified and summarized in PAD, Volume 1:

- Recent quantitative fisheries population information for Butte Creek and West Branch Feather River and feeder tributaries is absent or insufficient to evaluate the present operation of the Project.

[5] Project Area as defined in PG&E's DeSabla-Centerville Hydroelectric Project, FERC Project No. 803, Pre-Application Document (PAD), Volume 1 – Public Information, dated October 4, 2004.

- California Department of Fish and Game (2004a and b) presents all available stocking information and practices within the Project Area. The locations and numbers of stocked fish are provided in the PAD, Volume 1, Appendix H.

- Domagalski (2000) provides qualitative information on fish population composition on Butte Creek at the Honey Run Road crossing for 1997 and 1998 and Doe Mill Road crossing for 1997.

- Meyer (1977, 1978a and b) provides quantitative estimates for 1977 at a few locations in Butte Creek and the WBFR that may be used for comparison in the near future.

- PG&E (2004) presented 1986 electrofishing data for Butte Creek above the confluence with Clear Creek and upstream of Ponderosa Way Bridge, and tributary electrofishing data collected on Clear Creek and the Little West Fork Feather River.

- FWS (1974) provides visual fish counts from the Centerville Canal.

- Existing information for anadromous salmonids is provided in Study 6.3.3-1 Spring-run Chinook Salmon Snorkel/ Carcass Surveys and PG&E (2004).

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Study Plan 6.3.3-2

PERFORM INSTREAM FLOW STUDIES ON BUTTE CREEK

DRAFT - December 28, 2004

GOALS AND OBJECTIVES OF STUDY

This study will evaluate how changes in streamflow resulting from normal Project operations affect special status fish species ***{The applicant should look at other fish species too (ie rainbow trout)}*** in Project-affected[1] waters of Pacific Gas and Electric Company's (PG&E's or Licensee's) DeSabla-Centerville Project, FERC No. 803 (Project). The Instream Flow Incremental Methodology (IFIM) Physical Habitat Simulation (PHABSIM) model ***(The applicant should use 2-D model instead of PHABSIM)*** will be used to describe the relationship between weighted usable area (an index of available fish habitat) and stream flow.

The streamflow evaluation will provide participants in the relicensing process (Licensing Participants[2]) information which, in combination with the water temperature model (Study Plan 6.3.2-4 Develop Water Temperature Model and Monitor Water Temperatures) and other resource studies, will provide a basis for streamflow-related resource management decisions.

NEXUS BETWEEN PROJECT AND RESOURCE TO BE STUDIED AND HOW THE RESULTS WILL BE USED

The Project diverts water from Butte Creek and the West Branch Feather River (WBFR) and discharges the combined water at DeSabla and Centerville powerhouses. This pattern of diversion and discharge and resulting periodic change in flows has the potential to affect the quantity and quality (as measured by depths and velocities) of aquatic habitats. These flow-related changes in habitat may affect the distribution, behavior and/or numbers of fish species and their life stages in Project-affected reaches. Assessing the quantity and quality of flow-related aquatic habitat as it pertains to Butte Creek fisheries is essential for determining flow management options for the Project during relicensing. The results of this study will augment the existing streamflow-habitat information that has been collected for Butte Creek and assess the adequacy of existing protection, mitigation, and enhancement measures (PM&Es) for special status fish species, especially Central Valley Spring-run Chinook salmon (SRCS) and Central Valley steelhead (steelhead).

STUDY AREA

The proposed study area for the instream flow study has been segregated into two Project-affected reaches of Butte Creek: (1) between Lower Centerville Diversion Dam and Centerville Powerhouse, and (2) downstream of Centerville Powerhouse to the Honey Run Covered Bridge. For the purposes of this study, these reaches have been segregated based on streamflow and the location of Project (and Non-Project) facilities. In the PAD, Volume 1, a third reach was

[1] Project-affected as defined in PG&E's DeSabla-Centerville Hydroelectric Project, FERC Project No. 803, Pre-Application Document (PAD), Volume 1 – Public Information, dated October 4, 2004.

[2] FERC, Federal and state resource agencies, local governments, Indian tribes, members of the public, and others likely to be interested in the licensing proceeding

suggested for study: Butte Creek Diversion Dam to Forks of Butte Diversion Dam. This reach is not included in this draft study plan for the following reasons: (1) recent field collection efforts for the water temperature modeling has indicated that access to this reach is extremely difficult and potentially dangerous ***{But access still is possible (i.e. using helicopters) – Its just a matter of the cost;}*** 2) the fishery resources in this reach are not expected to include special status species because of the significant natural passage barriers downstream of the Butte Creek Diversion Dam ***but we still need to look at flow requirements for rainbow trout***; and 3) water allocation decisions in this reach will probably be driven by water temperature concerns for enhancing SRCS populations further downstream ***but we still need to set flow standards the rest of the year when temperature is not an issue***. Similarly, Licensee believes that water allocation decisions for the WBFR above and below Hendricks Head Dam will be primarily driven by water temperature concerns for SRCS populations in Butte Creek and that an instream flow study in these reaches would be of limited value. ***But we still need to set flow standards there (minimums at least) in the rest of the year when temperature is not an issue for SRCS.***

STUDY SITES

The study sites in each reach will be individual habitat units and will be selected randomly from habitat maps of the respective reaches. Study site selection will be finalized in consultation with NOAA Fisheries, U.S. Fish and Wildlife Service (FWS), U.S. Forest Service (USFS), the State Water Resources Control Board (SWRCB), and the California Department of Fish and Game (CDFG). For this study, two ***(we will probably need at least three replicate study sites of each habitat type)*** replicate study sites will be selected for each of the major habitat types (e.g., run, riffles, pools, etc. that collectively compose at least 90% ***for same reasons as below, this should be 97%*** of the total habitat) for each of the three reaches, as determined by the results of the habitat mapping effort. Rare habitats (composing <10% of the total habitat) ***(we recommend defining rare habitats as less than 3%, based on having a total of 40 transects per reach)*** will only be sampled if it is determined that they are critical habitats; such critical habitats may not be abundant enough to have replicate study sites. ***If PHABSIM is used, the applicant should have at least 40 transects per reach – The Service recommends using 40 transects per reach based on Gard (2005). This study found that 40 transects for juvenile salmonids would result in a 95% confidence limit for the flow at the peak of the curve of plus or minus 25%. We believe that this level of accuracy is necessary in this case to get reliable results, given the presence of listed species (spring-run Chinook salmon and steelhead trout).***

SCHEDULE

Habitat mapping will be conducted in summer 2005; ***Map steelhead (for reaches above and below Centerville Powerhouse) and rainbow trout (for West Branch Feather, below Butte Creek Diversion Dam, and associated tributaries) high-use spawning areas in winter 2005.*** study sites will be selected and established when the results of the habitat mapping effort are complete (approximately fall 2005). Transects within each study site will be established following the study site selection (approximately fall 2005). ***Use 2-D instead of transects. For Butte Creek above and below Centerville Powerhouse: 1) use FWS 2-D sites for spring-run juvenile and fry rearing and steelhead spawning, juvenile and fry rearing; 2) add more 2-D sites for fry and juvenile rearing to represent habitat types not or insufficiently represented in***

FWS sites; and 3) add more 2-D sites for steelhead spawning located in steelhead high-spawning-use areas which were not in FWS 2-D sites. Baseflow hydraulic data at each transect in the habitat-specific study sites may also be collected at this time. High flow information will be collected during the spring 2006 runoff period. ***Collect water surface elevations at flow of at least 225 cfs for reach above Centerville Powerhouse and at flow of at least 260 cfs for reach below Centerville Powerhouse to be consistent with flows in FWS study. If use PHABSIM, collect velocity set at highest flow.*** If baseflow hydraulic data were not collected in 2005, then it would be collected during the low flow period (July-September) of 2006.

Identification of the fish species and life-stages to be assessed in the IFIM analysis will be decided in coordination with the resource agencies. This decision should be completed by the end of summer 2005. Licensee currently proposes to assess habitat for yearling SRCS, steelhead spawning, juvenile steelhead, and fry, juvenile and adult hardhead ***also add spawning, adult and juvenile rainbow trout.*** An instream flow study evaluating SRCS spawning habitat has already been completed by FWS (FWS 2003) and PG&E (unpublished data) ***don't use PG&E data – not state of art for habitat studies***; at this time, Licensee does not propose to conduct a reassessment of SRCS spawning. Development of Habitat Suitability Criteria (given that the species and life-stages for analysis have been selected) will begin in fall 2005, and if after one year, sufficient observations to develop site-specific data have not been collected, then existing, published suitability curves would be selected in consultation with the resource agencies. ***For rainbow trout, we request that the applicant model for rainbow trout for the Butte Creek Diversion Dam to Forks of Butte Diversion Dam reach. The applicant should use the habitat suitability criteria the Service developed from the South Fork American River basin (US Fish and Wildlife Service, 2004) for adult and juvenile rearing, and use the Service's preliminary spawning criteria from the Yuba for rainbow spawning. If the applicant does develop site-specific rainbow trout criteria, they should collect cover and adjacent velocity data for adult, juvenile and fry rearing, and collect unoccupied data, and develop the criteria using logistic regression. The applicant would need to collect at least 150 observations of occupied locations for each life stage to develop meaningful data analysis. The above constitutes the current state-of-the-art for developing habitat suitability criteria and are necessary to develop scientifically-defensible criteria. For salmon fry and juvenile rearing, the applicant should use the Service's Sacramento River fall-run chinook salmon habitat suitability criteria (US Fish and Wildlife Service, 2005) and use our spawning sites for the habitat types that were in those sites, then select additional sites to represent the remaining habitat types. If the applicant does attempt to develop site-specific criteria for fry and juvenile rearing, they should collect cover, adjacent velocity data, unoccupied data, and develop the criteria using logistic regression. The applicant would need to collect at least 150 observations of occupied locations for each life stage to develop meaningful data analysis. The above constitutes the current state-of-the-art for developing habitat suitability criteria and are necessary to develop scientifically-defensible criteria. The use of Service spawning sites would reduce the required effort for this task. (See Service PAD comments on fry and juvenile chinook salmon and adult and juvenile rainbow trout criteria.)***

The data analysis and report preparation will begin in the fall of 2006 after data collection is complete. ***Habitat should be modeled up to 450 cfs for the reach above Centerville Powerhouse and up to 790 cfs for the reach below Centerville Powerhouse to be consistent***

with range of flows used in FWS study. Habitat should be modeled up to the median unimpaired flow in the highest-flow month for the other reaches (West Branch Feather, below Butte Creek Diversion Dam, and associated tributaries)

METHODS

Habitat Mapping: Habitat mapping will generally be conducted using methods developed by Bain and Stevenson (1999), Hawkins et al (1993), McCain et al (1990), and McMahon et al (1996). ***Use geomorphically-based habitat mapping system to characterize riffles, runs, glides and pools (Snider et al 1992) – this is current state of the art for habitat mapping.*** The results of the habitat mapping will provide the baseline information for selecting study sites and transects to be used in the Instream Flow Incremental Methodology (IFIM) Physical Habitat Simulation (PHABSIM) models ***(should use 2-D model instead of PHABSIM.)*** The habitat specific Weighted Usable Areas (WUA), determined from the PHABSIM analysis ***(should use 2-D model instead of PHABSIM)***, will be expanded to each entire study reach by weighting the WUA responses (i.e., WUA versus flow) by the respective relative abundance of each habitat type (determined from the habitat mapping) and summing across all habitats in the reach. ***For spawning, only model high-use spawning areas and extrapolate to entire reach based on percentage of spawning in the reach which is in the modeled sites – this is the current state of the art for simulating spawning habitat (Gallagher and Gard 1999). For the LCDD to Centerville Powerhouse and Centerville Powerhouse to Parrot-Phelan reaches, the applicant should also map adult spring-run holding habitat (probably a reasonable definition would be areas with depths greater than 3 feet - or based on where they actually see spring-run adults holding). The above is necessary to be able to evaluate trade-offs in summer spring-run chinook salmon rearing habitat for the bypass reach versus the reach below Centerville Powerhouse.***

A three-tiered habitat mapping classification system developed by Hawkins et al (1993) will be used to assist in the identification of individual habitat units in the field. Level III categories are generally modified/adopted from McCain et al (1990). Figure 1 shows the relationship among the three levels. At the broadest level, Level I categorizes habitats as "fast water" and "slow water". In Level II fast water is subdivided into two categories: turbulent and non-turbulent; slow water is also subdivided into two categories: scour pool and dammed pool.

Habitat mapping will be conducted by a pair of fishery biologists working as a team. Butte Creek will be mapped working in an upstream direction where possible. Data will be recorded onto standardized datasheets. Aquatic habitats will be visually delineated based on the framework provided by Hawkins et al (1993) and McCain et al (1990); ***Use geomorphically-based habitat mapping system to characterize riffles, runs, glides and pools (Snider et. al., 1992) – this is current state of the art for habitat mapping.*** each habitat unit will be uniquely numerically identified. Habitat units will be identified at the finest scale (i.e., Level III) and recorded onto the datasheet. Aquatic habitats also will be spatially referenced using a combination of GPS (preferably UTM, WGS 84 datum) and hip chain methodology. Other parameters recorded onto the datasheet will include: mean width, mean depth, maximum depth, substrate composition (including spawning gravel characterization), riparian vegetation, canopy, cover, and woody debris.

During habitat mapping, the location of spawning gravel deposits will also be mapped using GPS and the length and width of each deposit will be measured to the nearest tenth of a foot following the approach of Johnson and Kier (1998). ***Map steelhead (for reaches above and below Centerville Powerhouse) and rainbow trout (for West Branch Feather, below Butte Creek Diversion Dam, and associated tributaries) high-use spawning areas in winter 2005. Spawning gravel deposits, while necessary, are not necessarily useable for spawning due to factors such as low permeability – mapping high-spawning-use areas is a better way to locate spawning habitat.***

Approximately 0.75 river miles will be covered per day per habitat mapping team. Each team will consist of two members with habitat mapping experience.

Transect Establishment: At each habitat-specific study site two, randomly placed, instream flow transects will be established ***(should use 2-D model instead of transects).*** The length of the habitat-specific study site will be divided into twenty (20) equal length sections, and two sections will be selected for transect placement using a random numbers table. Each transect will be placed in the center of the randomly selected sections. In pool habitats, three transects will be randomly established in the following sections of that habitat type: one in the head, one mid-pool, and one in the tail out. If necessary, transect placement in rare, but key or essential habitats, will be established on a case by case basis in consultation with the resource agencies. Transects will not be located in habitats that cannot be modeled (i.e., cascades, falls, etc.), or do not provide fish habitat (i.e., bedrock sheet flow, etc.).

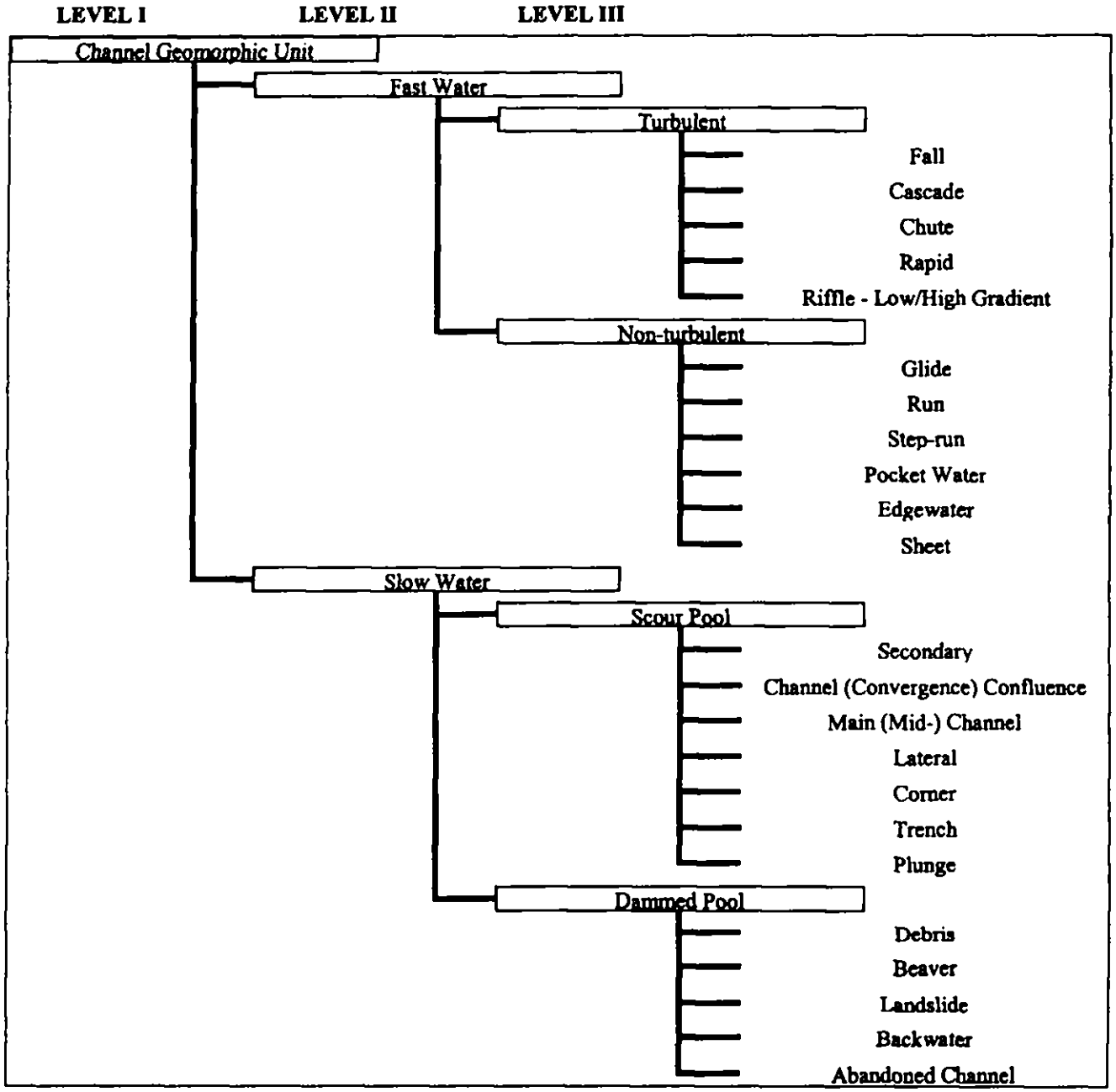

Figure 1. Three-tiered habitat mapping classification system adapted from Hawkins et al (1993) and McCain et al (1990).

Field Data Collection: Data collection and recording will be conducted using the standardized procedures and guidelines established in the PHABSIM field techniques manuals published by the Instream Flow Group, the developers of the PHABSIM system (Trihey and Wegner 1981; Milhous et al. 1984) ***(should use 2-D model instead of PHABSIM).***

In the reach upstream of Centerville Powerhouse, calibration flows will be selected to allow the models to simulate flows over a range covering the current minimum flow (40 cfs) up to approximately 90 cfs (to cover the range of Butte Creek unimpaired summer flow). V ***Habitat should be modeled up to 450 cfs for the reach above Centerville Powerhouse to be consistent with range of flows used in FWS study.*** Velocity data sets will be collected at the highest calibration flow practicable (given safety and access constraints) up to approximately 90 - 100 cfs and at the current, license-mandated minimum flow. ***If PHABSIM is used, velocity sets should be collected at a flow of at least 225 cfs for reach above Centerville Powerhouse and at flow of at least 260 cfs for reach below Centerville Powerhouse to be consistent with flows in FWS study - FWS found that it was safe to collect velocity sets at these flows.*** The proposed strategy is to complete the IFIM data collection as soon as the project stops spilling and flow, in the diverted reach, can be controlled. The highest flow that can be safely sampled, up to all of the summer unimpaired flow, will be released. ***If PHABSIM is used, velocity sets should be collected at a flow of at least 225 cfs for reach above Centerville Powerhouse and at flow of at least 260 cfs for reach below Centerville Powerhouse to be consistent with flows in FWS study - FWS found that it was safe to collect velocity sets at these flows.*** The flow will then be reduced to a mid-flow range (approximately 60 cfs (***the mid-flow range should be around 105 cfs for the reach above Centerville Powerhouse and around 240 cfs for the reach below Centerville powerhouse to be consistent with the flows in FWS study).*** and the study sites will be surveyed for changes in water surface elevation. The flow will then be dropped to the regulatory minimum, and re-measured (with a full stage and velocity data set) unless this data set has already been measured (e.g., in the fall of 2005). In the reach downstream of Centerville Powerhouse Licensee proposes to collect only a single set of depth and velocity measurements to represent the combination of summer base flow from Butte Creek plus water from the WBFR (approximately 130-170 cfs). ***Water surface elevations should be collected at three flows and the velocity set (if PHABSIM is used) collected at at least 260 cfs to be consistent with flows in FWS study.*** This reach is not subject to significant Project-related changes in flow and is being used as a benchmark for the amount of habitat downstream of the Centerville Powerhouse and to assess the incremental habitat benefit provided by the importation of WBFR water by the Project. ***Flows in this reach can be affected by project operations, for example based on how much water is diverted from the West Branch Feather to Butte Creek and the timing of releases from reservoirs.***

Hydraulic Modeling: The flow-hydraulic relationships will be modeled using an IFG-4A approach, except in pool habitat where the Water Surface Profile (WSP) analysis option may be used as appropriate. ***(Applicant should use 2-D model instead of PHABSIM).*** The high flow velocity data set will be used to estimate transect-specific hydraulic parameters and to simulate down to the low flow velocity data set. The low flow velocity data will be used to calibrate the models performance. That is, model predictions of measured low flow velocities will be compared with simulated velocities and adjustments to model parameters will be made, if necessary, to improve model performance.

Habitat Modeling:
Habitat Suitability Criteria (HSC): Licensee will attempt to develop site-specific habitat suitability curves for key species and life stages over a period of one year. Licensee anticipates that criteria will be needed for yearling SRCS, juvenile steelhead trout, and fry, juvenile and adult hardhead ***also for spawning, adult and juvenile rainbow trout.*** If sufficient observations to develop site-specific HSC have not been collected during the first year, then existing, published suitability curves will be selected in consultation with the resource agencies for use in running the instream flow model. ***For salmon fry and juvenile rearing, the applicant should use the Service's Sacramento River fall-run chinook salmon habitat suitability criteria (US Fish and Wildlife Service 2005). If the applicant does attempt to develop site-specific criteria for fry and juvenile rearing, they should collect cover and adjacent velocity data and collect unoccupied data, and develop the criteria using logistic regression. The applicant would need to collect at least 150 observations of occupied locations for each life stage. The above constitutes the current state-of-the-art for developing habitat suitability criteria and are necessary to develop scientifically-defensible criteria. For rainbow trout, the applicant should use the habitat suitability criteria the Service developed from the South Fork American River basin (US Fish and Wildlife Service 2004) for adult and juvenile rearing, and use the Service's preliminary spawning criteria from the Service's Yuba River Study for rainbow spawning. If the applicant does develop site-specific rainbow trout criteria, they should collect cover and adjacent velocity data for adult, juvenile and fry rearing, and collect unoccupied data, and develop the criteria using logistic regression. The applicant would need to collect at least 150 observations of occupied locations for each life stage to have meaningful data. The above constitutes the current state-of-the-art for developing habitat suitability criteria and are necessary to develop scientifically-defensible criteria.***

Licensee proposes to use published steelhead spawning HSC for this study. ***Use the Service's preliminary steelhead spawning criteria from the Services Yuba River Study.***

Habitat Modeling: Habitat will be modeled using the suite of submodels provided in the PHABSIM system (e.g., Habtae, Habtat, etc.). ***(Applicant should use 2-D model instead of PHABSIM).*** The output from this model will be the study site specific Weighted Usable Area (WUA per 1,000 ft of stream) for each species/life-stage analyzed at each simulated flow. This output will then be averaged over all study sites (using the relative abundance of each habitat type as a weighting factor) to obtain a reach-wide estimate of WUA by life-stage. WUA versus flow curves will be developed to aid in the interpretation of these habitat flow relationships.

ANALYSIS

Habitat Mapping: All habitat data (including spatial information) will be entered into a spreadsheet, such as Microsoft Excel and will be quality checked. Once the data is cleared, it will be loaded into a Microsoft Access database. The database will allow the user to query the data for specific information and create graphical and/or tabular summaries. These summaries may be segregated by a number of scenarios, for example: subreach, channel type, habitat type

(Level I, II, or III), or habitat type by subreach. The relative abundance of each habitat unit in a study reach will be determined for use in the PHABSIM modeling.

Hydraulic Modeling: The IFG-4A model will be used for hydraulic simulations; for pools the WSP analysis option may be used if appropriate. ***(Applicant should use 2-D model instead of PHABSIM)*** Standard outputs will be provided for external QA/QC evaluations (e.g., stage discharge relationships, Manning's n values, etc.). Resource agencies will be provided the calibrated data decks, upon request, if they wish to independently verify the simulation results.

Habitat Modeling: This study will develop a habitat-flow relationship for the two Project-affected reaches identified in "Study Area." ***This study should not develop habitat-flow relationship for spring-run Chinook salmon spawning in these two reach, but should instead use the habitat-flow relationships previously developed by FWS. Habitat-flow relationships should also be developed for spawning, adult and juvenile rainbow trout for West Branch Feather, below Butte Creek Diversion Dam, and associated tributaries*** These results will be used in conjunction with the results of other studies to determine if flow related habitat quantity and quality is affecting the fishery resources analyzed in the Project-affected reaches of Butte Creek ***and West Branch Feather and associated tributaries***. Information collected from Study 6.3.3-4 Fish Population Characterization will be used to compare fish populations, community structure, and size/age distribution to habitat availability.

CONSISTENCY WITH GENERALLY ACCEPTED SCIENTIFIC PRACTICE

The standard, agency recommended, approach to evaluating instream flow needs for fisheries resources in California is the PHABSIM using the IFG4A hydraulic model component of this system. ***PHABSIM is no longer the state of the art for modeling habitat – 2-D modeling is (Ghanem et al 1996, Leclerc et al 1995). This is the standard FWS recommends to evaluate instream flow needs for fisheries resources in California and is what FWS uses as a standard for conducting instream flow studies in California. The 2-D model avoids problems of transect placement, since the entire site can be modeled. The 2-D model also has the potential to model depths and velocities over a range of flows more accurately than PHABSIM because it takes into account upstream and downstream bed topography and bed roughness, and explicitly uses mechanistic processes (conservation of mass and momentum), rather than Manning's n and a velocity adjustment factor. Other advantages of 2-D modeling are that it can explicitly handle complex habitats, including transverse flows, across-channel variation in water surface elevations, and flow contractions/expansions. The model scale is small enough to correspond to the scale of microhabitat use data with depths and velocities produced on a continuous basis, rather than in discrete cells. The 2-D model does a better job of representing patchy microhabitat features, such as gravel patches.***

PRODUCTS

Study plan reporting requirements (initial and updated study reports and meetings) will be conducted within the timeframes set forth in 18 CFR § 5.15. Periodic progress reports will be provided to Licensing Participants semi-annually. At the conclusion of the study, a report will be produced containing a description of the methodology, documentation of the PHABSIM

modeling results ***(Applicant should use 2-D model instead of PHABSIM)***, and the habitat versus flow relationships for each species/life-stage analyzed. The report will be included as part of Licensee's Application for New License, Exhibit E.

RELATIONSHIP TO OTHER STUDIES

This study will be used in combination with the water temperature modeling to evaluate the range of management options available for protecting the fishery resources within the Project-affected waters.

LEVEL OF EFFORT AND STUDY COST

The preliminary estimated cost of field studies and reporting under this study plan is approximately $420,000 (2004 dollars). The preliminary estimate considers the following assumptions:

- Habitat mapping of 12 stream miles in Butte Creek, from the Honey Run Covered Bridge to Lower Centerville Diversion Dam, at the rate of 0.75 miles per day. ***Also need to habitat map West Branch Feather, below Butte Creek Diversion Dam, and associated tributaries***

- Habitat suitability criteria development for yearling SRCS, juvenile steelhead, and fry, juvenile and adult hardhead will occur simultaneously in the late spring and summer. ***Based on our experiences on the Yuba River, juvenile steelhead are present from October to January, not late spring and summer. Criteria also needed for spawning, adult and juvenile rainbow trout***

- The diverted reach from Lower Centerville Diversion Dam to Centerville Powerhouse is composed of two subreaches (with a boundary near Helltown Bridge); if each subreach is limited to no more than 5 habitats, it results in 20 study sites and a total of 44 transects. ***Applicant should use 2-D model instead of PHABSIM. Effort will be reduced by using FWS 2-D sites.***

- The reach downstream of Centerville Powerhouse will require 10 sites (22 transects). ***Applicant should use 2-D model instead of PHABSIM. If the Applicant uses PHABSIM, there should be 40 transects for this reach. If the applicant uses PHABSIM, then they also need 40 transects per reach for West Branch Feather, below Butte Creek Diversion Dam, and associated tributaries. Effort will be reduced by using FWS 2-D sites.***

- A team of 3 collecting depth and velocity data can do 3 sites per day (i.e., 6 transects including travel).

- A team of two can measure stage data at 6 sites per day (including travel).

EXISTING INFORMATION

The following existing instream flow information is included in PAD, Volume 1:

- Icanberry (1979) and Steitz [1985] presented instream flow/trout habitat simulations using the Water's methodology, an early approach to instream flow/habitat modeling. ***This data should not be used – not state of art for habitat studies***
- FWS (2003) used a 2-D hydraulic and habitat model to evaluate the spawning habitat flow relationship for spring-run Chinook salmon in the Project-affected reaches of Butte Creek below LCDD.
- Dunn and Roberts [1984] presented an IFG-4 instream flow study for the WBFR below Hendricks Head Dam, in a section downstream of flow accretion from Big Kimshew Creek and other tributaries. ***This data should not be used – not state of art for habitat studies***
- In 1982 Licensee conducted an instream flow study to evaluate spring-run Chinook spawning habitat using the 1-D IFG-4 hydraulic model [PG&E, unpublished data]. ***This data should not be used – not state of art for habitat studies***

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Study Plan 6.3.2-4

DEVELOP WATER TEMPERATURE MODEL AND MONITOR WATER TEMPERATURES

DRAFT – January 3, 2005

GOALS AND OBJECTIVES OF STUDY

The relationship between stream flow and water temperature in the waters affected by Pacific Gas and Electric Company's (PG&E's or Licensee's) DeSabla-Centerville Hydroelectric Project, FERC No. 803, (Project) is an identified informational need in the relicensing of the Project (PG&E 2004). Information from water temperature monitoring will be useful in assessing water temperature related issues in the Project Area[1], including the affect of operational alternatives on the waters in Butte Creek and the West Branch of the Feather River (WBFR). Water temperature, in general, has been an area of investigation for many years. The annual Project Operations and Maintenance Plans developed by Licensee in consultation with California Department of Fish and Game (CDFG), National Marine Fisheries Service (NOAA Fisheries), and U. S. Fish & Wildlife Service (USFWS) are a coordinated attempt by PG&E and the fishery resource agencies (NOAA Fisheries, CDFG, and USFWS) to maximize the cool water benefits provided by the Project in Butte Creek during the summer months for the protection of spring-run Chinook salmon and steelhead, through changes in Project operations (e.g., timing and magnitude of releases from Project reservoirs).

PG&E and the fishery resource agencies believe that expanded water temperature monitoring and the creation of a predictive stream temperature model would improve their ability to manage Butte Creek stream temperatures through changes in Project operations. The Forest Service has not been involved in the more narrowly focused water temperature discussions on Lower Butte Creek, off of National Forest System lands (NFSL). However, with the broader relicensing perspective and the fact that the cold-water pool available for attenuating warm summer water temperatures in Butte Creek are derived from and across NFSL (mostly from Philbrook Reservoir and down Philbrook Creek), the Forest Service will be an additional resource agency involved in decisions concerning water temperature during relicensing.

[1] Project Area as defined in PG&E's DeSabla-Centerville Hydroelectric Project, FERC Project No. 803, Pre-Application Document (PAD), Volume 1 – Public Information, dated October 4, 2004.

The goals and objectives of this study are: 1) to provide monitoring sufficient to assess project related water temperature relicensing issues; and 2) develop a stream temperature model that can be used to evaluate the range of operational alternatives for managing stream temperatures in Lower Butte Creek during the summer months (June through September) between DeSabla Powerhouse and immediately downstream of Centerville Powerhouse for the benefit of spring run Chinook salmon and other aquatic resources. ***The Water Temperature Model proposed by the applicant should be extended all the way to Parrot-Phelan Dam, or at least to the downstream end of adult spring-run holding habitat below Centerville Powerhouse, so the Service and stakeholders can examine tradeoffs of holding habitat above versus below Centerville Powerhouse associated with increased flows in the reach above Centerville Powerhouse. The above information is needed to be able to evaluate trade-offs in summer spring-run chinook salmon rearing habitat for the bypass reach versus the reach below Centerville Powerhouse.***

NEXUS BETWEEN PROJECT AND RESOURCE TO BE STUDIED AND HOW THE STUDY RESULTS WILL BE USED

The Project diverts water from Butte Creek and WBFR watersheds and discharges this water into Butte Creek. This diversion and discharge has the potential to affect water temperatures in the reach of Butte Creek below Lower Centerville Diversion Dam utilized by spring-run Chinook salmon. The relationship between Project operations and stream temperature in Butte Creek is a central issue to understanding how to maximize the beneficial effects of the Project on spring-run Chinook salmon and steelhead. The results of the temperature model simulations will be used to (1) better understand Project affects on water temperatures in Butte Creek from DeSabla Powerhouse to just below Centerville Powerhouse ***Need to understand how project affects water temperatures all the way to Parrot-Phelan Dam, or at least to the downstream end of spring-run adult summer holding habitat,*** (2) evaluate what Project operation alternative (or combination of alternatives) can best protect spring-run Chinook salmon and steelhead in Butte Creek from temperature-related pre-spawning mortality, and (3) evaluate the affects of Project operational alternatives on the thermal environment of other aquatic resources.

STUDY AREA

The study area for water temperature monitoring will be Butte Creek from Butte Creek Head Dam to below the Centerville Powerhouse ***The study area should be all the way to Parrot-Phelan Dam, or at least to the downstream end of spring-run adult summer holding habitat,*** and the WBFR from Round Valley and Philbrook Reservoirs to the Miocene Diversion. The study area for the water temperature modeling study will include Round Valley and Philbrook reservoirs and the stream channels from each reservoir to Hendricks Head Dam on the WBFR, the Hendricks and Toadtown canals, the combined Butte Creek and Toadtown canal into DeSabla Forebay, the DeSabla Forebay itself, and Butte Creek (including lower Centerville Canal) from the DeSabla Powerhouse to just below the Centerville Powerhouse (after the confluence of Butte Creek and the Centerville Powerhouse tailrace waters) ***The study area should be all the way to Parrot-Phelan Dam, or at least to the downstream end of spring-run adult summer holding habitat.*** These combined study area encompass the Project structures (e.g., reservoirs, canals, forebays, and powerhouses) that can affect aquatic resources and are utilized in the management of temperatures in Butte Creek for the benefit of holding Spring-run Chinook salmon and rearing steelhead. As discussed below, it may be necessary to model DeSabla Forebay through a separate study using different modeling tools in order to evaluate the potential for changes to minimize heating there.

STUDY SITES

Water Temperature monitoring needs and stream temperature model development/calibration requires information to be developed relating to reservoirs (e.g., bathymetry and temperature profiles), stream geometry and shading parameters in river reaches, stream temperatures at key locations, flows, and meteorology within the study area. Table 1 describes the proposed study sites that will be monitored for water temperature, stream flow, and meteorology. There are 38 temperature stations (Figure 1), 5 temporary continuous flow stations (in addition to the

permanent flow gages), and 4 meteorology stations spanning the two basins (Butte Creek and WBFR). Table 1 provides information on hydrologic groupings (Station Work Group), monitoring station names, ID, intended monitoring activity, and general descriptive notes. In Butte Creek, these data will be supplemented by three CDFG temperature monitoring stations located in the reach between the Lower Centerville Diversion Dam and Centerville Powerhouse (Quartz Bowl, Chimney Rock, and CDFG Pool 4). In the WBFR, the following monitoring locations were added at the request of the USFS: 1) half-way between the Hendricks Head Dam and the Miocene Diversion (non-project) on National Forest System lands (NFSL) around River Mile 22, 2) upstream from the Miocene Diversion on NFSL around River Mile 15, and 3) approximately half way between these two new sensors to be located in a deep pool on NFSL. The latter is intended to determine whether there is any water temperature stratification in deep pools in this river reach.

SCHEDULE

- Summer 2004: Stream temperature, flow, & meteorology monitoring (for stream temperature model calibration).
- Late summer – fall 2004: Fieldwork to gather reservoir and stream channel information necessary to model Butte Creek and WBFR systems.
- Late fall 2004 – early spring 2005: Model development and calibration.
- Summer 2005: Stream temperature, flow, & meteorology monitoring (for stream temperature model validation).
- Late fall – winter 2005: Model validation.
- Winter – spring 2006: Simulation of alternative operational scenarios.
- Summer 2006: Report production.

METHODS

Monitoring: Continuous recording, laboratory calibrated, thermographs will be placed in the stream to obtain hourly measurements of water temperature. These sites will be revisited monthly to download data and check equipment operation/calibration. PG&E's experience from years of monitoring activity in the basin is that installation procedures, equipment reliability, and Quality Assurance/Quality Control (QA/QC) protocols are such that few losses of data have occurred—one loss of 15-20 days in 2003 with an older vintage recorder (no longer in use) at the canal input to DeSabla Forebay. In-situ water quality data will also be gathered at each station (instantaneous temperature, DO, pH, conductivity) during this routine maintenance check. Thermal profiles will be conducted at all Project reservoirs. Since Philbrook Reservoir is stratified during the summer (unlike Round Valley Reservoir, which is isothermal), a continuous recording thermal array will be suspended in Philbrook Reservoir to record surface, mid, and bottom water temperatures near the dam (i.e., the deepest part of the reservoir). Continuous recording, temporary, staff gages will be deployed at five locations. Measurements of discharge will be taken each month for development of a gage-specific discharge rating curve. Periodic stage and discharge measurements will be taken, using USGS stream discharge measurement protocols, at six locations (see Table 1). Complete meteorological stations measuring air temperature, wind speed and direction, relative humidity, and solar radiation will be deployed at

DeSabla Forebay and Philbrook Reservoir. A limited meteorological station (with air temperature and wind data) will be set up at DeSabla Powerhouse (to check for canyon influences).

Surveys: A bathymetric survey will be performed in Philbrook Reservoir using PG&E GPS and Fathometer equipment. Existing bathymetry for Round Valley Reservoir and DeSabla Forebay will be used for modeling purposes. Stream geometry will be systematically sampled with field surveys in the WBFR between Round Valley Reservoir and Hendricks Head Dam, Philbrook Creek from Philbrook Reservoir to the confluence of WBFR, and Butte Creek between DeSabla Powerhouse and Centerville Powerhouse using combinations of GPS survey grade equipment, laser range finders, and traditional survey methods at locations where access permits. Data on channel width, depth, slope, stream orientation (azimuth), gradient breaks (e.g., plunge pool drops), topographic and vegetation shading will be collected. This sampling will provide sufficient detail to build a representative model prototype of the system and is not intended to statistically characterize the variability of the stream channels in the study reaches. Sampled geometry will be supplemented by gradient and topographic data taken from USGS topographic maps or Digital Elevation Maps (if available at sufficient spatial resolution). These data are intended to fulfill the needs of model development only and may not be adequate to address other issues (e.g., channel erosion below reservoirs, residual pool volumes, etc.).

ANALYSIS

Monitoring: Two sets of analyses will be developed. The first one will be for the purpose of summarizing the thermal characteristics of the various sites. Minimum, maximum, and mean daily statistics at each site will be developed. The second set of analyses will identify general patterns in water temperature, as a function of time and distance downstream. Spatial and temporal variation at each site will be graphed. Thermal profiles in each reservoir will also be graphed as a function of depth.. In a similar fashion meteorology and flow information will also be summarized and graphed. All of the water temperature, flow, and meteorological data will be formatted for input into the stream temperature model. All temperature, flow, and meteorological data sets, on hourly time-intervals, will be made available to participants in the licensing process (Licensing Participants)[2] upon request.

Stream and Reservoir Modeling: The Army Corp of Engineers CE-QUAL-W2.v.3.2 (W2) is proposed for modeling the study area. This model is a two-dimensional, laterally averaged, hydrodynamic and water quality model. It has been applied to rivers, lakes, reservoirs, estuaries, and combinations thereof. The model has been used extensively to predict water surface elevations, velocities, reservoir temperature stratification and water temperatures at various outlet structures. The model is built to accommodate multiple waterbodies, reservoirs with multiple branches, multiple inflows and outflows, time-varying boundary conditions, and layer/segment addition and subtraction. The W2 is a finite element model, which can compute water temperatures at sub-minute time intervals; as such it can effectively model daily variations in water temperatures (i.e., daily minimums, means and maximums).

[2] FERC, Federal and state resource agencies, local governments, Indian tribes, members of the public, and others likely to be interested in the licensing proceeding.

W2 is well suited to handle the combination of reservoirs, stream sections, canals, powerhouses, and diversion reaches characteristic of the Project. However, it is possible that the circulation patterns within DeSabla Forebay are too complex to be adequately modeled using W2. If this is the case, the forebay may need to be modeled using a different approach. PG&E proposes to have experts evaluate this issue in the fall of 2004 and, if another modeling approach is needed for the forebay, PG&E will develop a supplemental study outline at that time for resource agency review and comment.

A long-term data base will be developed to represent the normal and the extreme hydrological and meteorological conditions for the watershed. The definition of these conditions will be developed in coordination with the Licensing Participants. Using these environmental settings, the model will be applied to determine and bracket the corresponding temperature regimes for the various operational alternatives. The operational alternatives to be simulated will be developed in coordination with Licensing Participants.

CONSISTENCY WITH GENERALLY ACCEPTED SCIENTIFIC PRACTICE

The choice of W2 as a modeling approach is consistent with generally accepted scientific practice. This public domain model has been used in hundreds of applications and has an established record of acceptable performance that will meet (or exceed) the needs of this study. The model is based on fundamental, scientifically sound principles and utilizes recognized numerical procedures to simulate changes in water temperature with flow, meteorology, and operations.

PRODUCTS

Study plan reporting requirements (initial and updated study reports and meetings) will be conducted within the timeframes set forth in 18 CFR Part 5. Periodic progress reports will be provided to Licensing Participants annually. A final stand-alone report will be produced and consist of the following major sections: purpose of study, study area, methods (field and modeling), results (calibration and simulation), analysis (relative effectiveness of operational alternatives simulated), conclusions (identifying the most effective alternative evaluated), and literature cited. Detailed model documentation will be provided as an appendix to the report. Detailed results of all the monitoring studies will also be provided in the appendix. If conditions in DeSabla Forebay are modeled separately, the results of that model will be incorporated as inputs into the overall Project temperature model.

LEVEL OF EFFORT AND COST

CE-QUAL-W2 was selected for this study because of its ability to model, within a single computational framework, a complex, interconnected watershed composed of reservoirs, canals, forebays, and stream reaches. The two-dimensional capabilities of this water temperature model are also important for representing the cold water pool within Philbrook Reservoir and the thermal characteristics of DeSabla Forebay (which is also stratified during the summer). In addition, W2 is capable of explicitly modeling the daily (i.e., minimum and maximum)

fluctuation in water temperature and the travel time of water from Project structures (e.g., Philbrook Reservoir) to the Butte Creek diversion reach below LCDD. The number and distribution of the temperature, flow, and meteorology monitoring stations were selected to ensure adequate input to, and calibration of, data for the W2 model. Stream temperature monitoring stations are located at the beginning and end of major stream segments, above, below, and in major tributaries. Temporary continuous recording flow gage were installed at five locations and supplemental flow measurements are taken at 6 other sites, in addition to PG&E's existing network of flow gages to allow accurate assessment of major tributary inflow and overall flow accretion in major stream sections. Two full meteorology stations were deployed (at Philbrook Reservoir and DeSabla Forebay) to measure conditions near the upper and middle elevations of the Project, and a third station to measure air temperature and wind direction was installed at DeSabla Powerhouse to assess conditions within the Butte Creek Canyon itself. The data collection described above will provide sufficient information to develop a reliable water temperature model for the Project. Collecting monitoring data over two years to characterize the thermal effects of Project operation and for model calibration is consistent with generally accepted scientific practice. This level of effort is expected to be adequate to provide information about Project related water temperature effects and a robust water temperature simulation model.

The effort to obtain the necessary information to characterize water temperatures in the Project-Area; plus develop, calibrate (with two years of data), and perform limited simulations (approximately 3 operational alternatives over 9 combinations of meteorology and hydrology) is approximately 525 person-days (plus other direct costs). The cost for this level of effort is estimated to be approximately $495,000.

EXISTING INFORMATION

Water temperatures have been monitored within the Butte Creek and WBFR watersheds by the Licensee and several of the resource agencies over the course of several decades. Beginning in the 1980s, continuous water temperature monitoring with some form of remote recording thermograph became commonly used to establish the thermal regime in a stream or reservoir. The extent of these monitoring programs and their results are summarized in PG&E's PAD, Volume 1, Section 5.2.9. The only temperature modeling that has been completed for Butte Creek concentrated on the diverted reach from Lower Centerville Diversion Dam to the PG&E Pool 4 located at 3.8 miles downstream of Lower Centerville Diversion Dam [Kimmerer and Carpenter 1989].

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Table 1: DeSabla-Centerville Project Water Temperature Monitoring Locations

Station Work Group		Stations	Activity	Temp	Flow	Met	Description
Upper West Branch Feather River (WBFR)	1	Round Valley Res.	IN, PR	—	HG		Storage facility
	2	WBFR blw RVR	TR, IN	1	HG		Round Valley Release
	3	Coon Hollow Crk	TR, IN	1	S		Primary tributary
	4	WBFR-2	TR, IN	1	S		WBFR below confluence with spring complex and Coon Hollow Creek
	5	WBFR-3	TR, IN	1	1		WBFR above confluence with Philbrook Creek
	6	WBFR-4	TR, IN	1	(add 5&12)		WBFR below confluence with Philbrook Creek
	7	Last Chance Crk	TR, IN	1	S		Tributary
	8	WBFR at Hend Head	TR, IN	1	HG		End of reach condition, likely SWRCB mine issues.
Philbrook Creek	9	Philbrook Creek above Philbrook Res	TR, IN	1	S		Captures the Carr Mine runoff, likely SWRCB issue.
	10	Philbrook Res.	TR, IN, PR	3	HG	1	Buoy in Reservoir
	11	Philbrook Crk at dam	TR, IN	1	HG		At release gage
	12	Philbrook Crk at mouth	TR, IN	1	1		To capture spill flow and heating in channel
Lower West Branch Feather River (WBFR)	13	WBFR-5	TR	1	—		WBFR on NFSL near RM 22
	14	WBFR-6	TR	1	—		WBFR, deep pool on NFSL near RM 18.5
	15	WBFR-7	TR	1	—		WBFR above Miocene Diversion on NFSL near RM 15
Hendricks-Toadtown Canal	16	Hendricks below Long Ravine	TR, IN	1	HG		Captures result of mixing canal flow with natural runoff
	17	Toadtown at TTPH	TR, IN	1	HG		Start of Toadtown Canal
	18	Toadtown at BW-12	TR, IN	1	HG		End of Toadtown Canal
	19	Butte Canal abv TTC	TR, IN	1	HG		End of Butte Canal
	20	Canal inflow to Forebay	TR, IN	1	(add 15&16)		Result of combining Butte and Toadtown canals
DeSabla Forebay	21	DeSabla Forebay	IN, PR	—	HG	1	Forebay conditions
	22	DeSabla Powerhouse	TR, IN	1	HG	1	DeSabla tailrace release to Butte Creek

Upper Butte Creek	23	Butte Crk at Butte Head	TR, IN	1	HG		Initial Butte Creek and Butte Canal conditions
	24	Clear Creek (may be intercepted by canal)	TR, IN	1	S		Tributary
	25	Butte Crk above West Branch	TR, IN	1	1		
	26	West Branch Butte Creek	TR, IN	1	S		Tributary
	27	Butte Crk above Forks of Butte diversion	TR, IN	1	HG		End of PGE bypass reach
	28	Butte Crk above Forks of Butte PH	TR, IN	1	—		End of Forks of Butte bypass reach.
	29	Butte Crk abv DeSabla PH	TR, IN	1	1		Condition of Butte Creek above DeSabla PH
	30	Butte Crk at LCDD	TR, IN	1	HG		Start of lower Butte Creek bypass reach
Lower Butte Creek	31	Quartz Bowl	TR	1	—		CDFG Monitoring Site-S7
	32	Chimney Rock	TR	1	—		CDFG Monitoring Site-S8
	33	Butte Crk at Pool 4	TR, IN	1	—		Historic monitoring location
	34	CDFG's Pool 4	TR	1	—		CDFG Monitoring Site-S9
	35	Butte Crk abv Cville PH	TR, IN	1	1		End of bypass reach
	36	Centerville PH at Header box	TR, IN	1	HG		End of canal, PH tailrace condition
	37	Butte Crk blw Cville PH	TR, IN	1	(add 30&29)	1	Result of all flow back into stream
	38	Butte Crk above Honey Run Bridge	TR, IN	1	—		End of Butte Creek reach

☐ Indicates a station that has been typically monitored as part of the FERC compliance monitoring.

1 Station where a temporary continuous flow recorder will be located.

S Station with flow based on periodic staff gage readings and flow measurements.

HG Hydro generation gage station

IN Station where in-situ WQ measurements will be taken

TR Station where a continuous temperature recorder will be located.

PR Station where temperature profiles will be taken

Figure 1. Schematic of 2004 PG&E Thermograph Locations